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THE GALLOWAY SCHEME

The ELECTRICAL REVIEW

FOUNDED 1872

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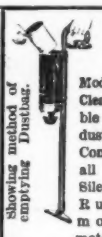

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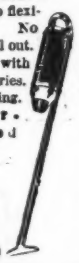

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The
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Economy in Distribution

IN making plans ahead for distribution, it is first of all necessary to bear in mind that loads will probably be quadrupled within the next ten years. Nevertheless, although a broad picture of this kind is most helpful in laying down general principles, it is inadequate to meet the problems involved in individual cases. These must be dealt with on their particular merits, but the means employed in any instance should be flexible enough to allow of their being later worked in as an integral part of a comprehensive scheme without crippling a small venture by too-heavy a capital expenditure at the outset.

Many more distribution questions are unsettled than have been decided, as Mr. W. Fennell pointed out in his address as chairman of the I.E.E. Transmission Section. This applies particularly to rural areas, which offer most scope for mains extensions; possibly it is yet too early to attempt to work out the background of an ideal system for such conditions, as was done for cities nine years ago in the I.E.E. paper of Messrs. Beard and Haldane. However, the opportunities afforded by the Transmission Section meetings for pooling a diversity of experience should lead to a consolidation of opinion regarding rural supplies also.

In referring to the President's "figure of merit" of kWh sold per £1 of distribution capital, Mr. Fennell asserts that much of the savings that have accrued through a reduction in manufacturing costs have been thrown away by over-elaboration of equipment. One can call to mind many examples of more lavish expenditure than either a supposed increase in reliability, expectation of future loads or advantages of standardisation seem to warrant.

In not seeking to discover what items can be left out rather than what can be put in, the elementary engineering principle of making the most efficient use of resources has often been violated, but we doubt whether these unimaginative people have done as much harm as the man who tries what "a piece of string and a cocoa tin" will do. In some ways we believe there has been appreciable improvement recently, for example, in a more intelligent layout of switchgear with the elimination of redundant units.

In steering a mid-course between these extremes, Mr. Fennell makes a number of suggestions as to how savings may be effected (none the less acceptable because some may be regarded as unorthodox). Prominent among these is his advocacy of high-voltage single-phase overhead lines instead of low-voltage four-wire distributors in sparsely populated districts; these would also simplify voltage regulation, and a system that may be the best for towns is not necessarily the most suitable for the open country.

The initial overall economy of the single-phase construction would, however, have to be debited with the higher cost of motors, since what is needed is not so much the lowest cost per kWh as the lowest cost of the overall service given to the consumer.

Mr. Fennell urges economy of capital expenditure as the first essential towards increasing Mr. J. M. Kennedy's figure of merit. If this precept be carried out in the spirit of "look before you leap," as he suggests, a reasonable compromise between immediate and ultimate economy should be attainable.

Our Members of Parliament

IN the new House of Commons electrical interests have a larger numerical and, we hope, influential representation than previous Parliaments. From the brief biographical references accompanying the portraits which appear on page 728 of this issue it will be seen that it includes a substantial group of men with first-hand knowledge of electricity supply organisation and its problems. Mr. Herbert Morrison, a former Minister of Transport, who found time to assist electrical development movements during his period of office, has returned to the debating chamber, where, should occasion arise, he may be expected to advocate the sweeping policy about which he has expressed himself in print. Mr. Hore Belisha, the Minister of Transport in the late Government, may find more

time in the next to deal with a subject which he could hardly do justice to while traffic problems absorbed so much of his time. Mr. G. Balfour and Sir Philip Dawson again return to the House with a quite expert knowledge of electricity supply legislation and the electrical industry. Sir Arnold Gridley, Mr. J. Chuter Ede, Mr. H. G. Williams, and Sir William Ray all have claim to mention in the department of electric power supply and electrical development. Electrical engineers and others of distinction who are again returned include Mr. A. E. L. Chorlton, Sir W. Preston, Mr. P. J. Hannon, Sir Brograve Beauchamp, Sir Joseph Nall, Sir George Hamilton, and Sir George Hume.

British Hydro-electric Plant

THE leading constructional and technical features of the Galloway hydro-electric scheme are surveyed in an article which we publish in this issue. From this it will be seen that it is a noteworthy piece of engineering work—but there is more in it than that. Since the work of construction began in 1931 a very large number of men, both skilled and unskilled, have been engaged, making a substantial and economical contribution to the solution of the unemployment problem. Another point is that the scheme again demonstrates the ability of British engineers to plan and carry through large-scale hydro-electric undertakings. The whole of the plant is being manufactured in this country, this again providing employment for British workmen, in addition to showing the world our capabilities in this direction.

Edinburgh Electrical Exhibition

WHEN the Incorporated Municipal Electrical Association holds its annual convention at Edinburgh in June next there will, of course, be an exhibition of electrical products. Manufacturers will not have their attention divided between the B.I.F. and the I.M.E.A. display, as in 1935, for the Birmingham Fair will be closed some months before the convention opens. There should, therefore, be little to prevent them from lodging their applications for space with E.D.A. at an early date. An announcement published elsewhere in this issue gives December 9th as the latest time, and we hope there will be a good response. If a substantial exhibition is assured it will add to the attractiveness of the convention.

The Difference

WE have in front of us a cheap pear switch recently imported into this country. At first sight it bears a close resemblance to a miniature product of a well-known British manufacturer, but closer examination reveals differences more striking than the superficial similarity. In the first place, the synthetic resin moulding is not so smoothly finished and the interior connections are flimsy, while the cumulative effect of the heating of the contacts (which might be expected in the early days of use) would be to take the spring out of the copper arms within a short time. The worst feature is, however, the low insulation resistance, which is only 300 megohms between each side terminal and the middle terminal and 200 between the two side terminals. These figures should be compared with those given us for a similar British article of about 60,000 megohms between side and middle terminals and 40,000 between side terminals. In damp atmospheres the foreign switch would be a source of danger.

Wimbledon's Record

YEAR by year it is proved by Mr. A. E. McKenzie, of Wimbledon, that a supply can be given at very low prices in a residential district and yet bring in a substantial profit. The Corporation's net profit continues to go "up and up," and last year amounted to £53,723 on an income of £265,665. It is pleasing to see that nothing is allocated to the relief of rates, although as in Wimbledon 99.4 per cent. of the buildings are connected such a contribution would not be the inequitable tax upon consumers which it usually is. Over 18 per cent. of the domestic premises in the area now have electric cookers, there being 6,068 on hire at the end of the year, as well as 6,191 water heaters, 6,178 irons, 6,862 radiators and 1,802 water heaters. Accelerated progress may be expected in such a town as this, for instead of having to break entirely new ground the Department is preaching to the already converted.

Informing the Public

THE question as to how far the self-denying ordinance imposed by the Association of Consulting Engineers on its members regarding "advertising" should be carried was raised once more at the annual dinner. Sir Clement Hindley, taking the objective view of one in a different branch of the profession, appreciated the danger of relaxing the present rules against advertising (in which the Association is in line with the Institutions of Electrical and Civil Engineers), but urged the need for corporate publicity. The duties of consulting engineers often include responsibility for design and construction, and the services of one who is entirely dissociated from manufacturing or contracting interests should be most valuable. There is, no doubt, a need, as Sir Cyril Kirkpatrick said, to educate town clerks as to what a consulting engineer is and does. He is not permitted to reply to advertisements, but there would presumably be no objection to the Association's submitting to the responsible authority a list of names of those specialising in the class of work under consideration, stating the general conditions under which qualified consultants may be retained.

Engineering Degrees

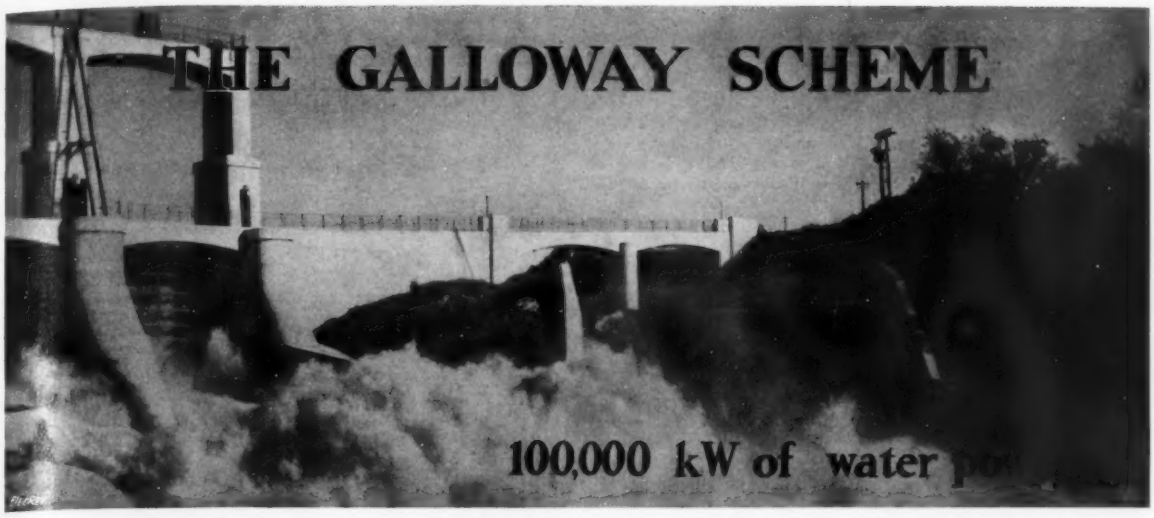
THE correspondence now in progress regarding the relative values of degrees and membership of technical societies should be helpful to many who wish to make progress in their profession. Those who live in small towns where advanced educational facilities are few will be still more seriously handicapped by a ruling of the Senate of London University that will, after this year, prevent the taking of the external degree of B.Sc. (Eng.) without submitting course work carried out in an approved college or institution. We are far from under-estimating the cultural value of collegiate training, but will not the new rule, if rigidly applied, be likely to exclude men whose academic attainments entitle them to the recognition accorded by a degree?

High-voltage Alternators

THE installation of the first 36-kV alternator at Salt River power-station (following the pioneer machine at Brimsdown) was a courageous step, as it entailed exposing the stator to the effects of the notoriously destructive South African lightning on the transmission system without a step-up transformer as a buffer. That Mr. G. H. Swingler, the city electrical engineer of Cape Town, is satisfied with its reliability has been shown by two repeat orders. Recently a serious accident on a switchboard put a "dead short" across the terminals of a 25,000-kW 36-kV alternator with automatic voltage control. The fault lasted for seven minutes until steam could be shut off the turbine, but Messrs. Parsons inform us that subsequent examination showed no signs of electrical or mechanical injury to the windings. This provides an illustration of the correctness of the view that in making the utmost of technical developments we do not necessarily prejudice safety.

Superstition

THE popular belief that metal attracts lightning was mentioned at a recent inquest on a man who had been killed while handling a shovel. Professor W. M. Thornton exposed the fallacy of the view that this contributed to his death, but no doubt people will continue, as of yore, to conceal knives and cover up metal fittings as a vain protective measure.



THE construction of an extensive hydro-electric scheme means considerable alteration to the map—at any rate that is the case with the hydro-electric scheme in Galloway, where the Galloway Water Power Co. has created new lochs, diverted rivers and left the original water beds more or less dry to arrest 100,000 kW of water power for the production of about 200 million kWh annually. And to the electrical visitor unaccustomed to thinking in terms of water power the knowledge that the many workings spread over an area of a few hundred square miles has an ultimate practical interpretation the same as the construction and erection of coal-handling plant, boilers and ash conveying systems renders his tour something more than interesting. All the work is to be seen within one of Scotland's most beautiful areas, making a visit a most enjoyable experience.

Nature's contribution to this scheme is the continuous waterway of the Rivers Dee and Ken, and the Water of Deugh, embracing the River Dee and Loch Ken in the valley running between the sea on the south coast at Kirkcudbright and a point about 40 miles north, with water levels varying from about 700 ft. above O.D. (Ordnance datum) in the north to about 20 ft. above O.D. in the south. There are also almost natural facilities for storing large quantities of water at Loch Doon in the north and at Clatteringshaws, a few miles west of the water line indicated at about two-thirds of the way up from the southernmost point of the scheme.

A beauty spot which is to be submerged— Tinkler's Loup and Bridge

The principal storage on the completed scheme will be in Loch Doon at the north end. By the construction of a dam across its northern outlet to the River Doon and some subsidiary dam works, it will be possible to raise the present level of the loch by some 27 ft., giving a storage capacity of about 2,900 million cu. ft. and a draw-down of 40 ft. This amount of water storage represents 23 million kWh of energy.

The main supply to the loch is from the upper reaches of the watershed of the River Deugh, about four miles east of the loch. A small dam across the Deugh diverts the flow into a tunnel which pierces the intervening hill into the next valley in which flows the Carsphairn Lane. A further stream (the Bow Burn) which drains a hollow in the hills adjacent to the Deugh watershed is also led to the tunnel by the construction of an intake thrown across the stream and a flume about two miles long leads the water to the tunnel intake.

The tunnel from the Deugh is continued in the valley by a section of open channel and an aqueduct across the Carsphairn Lane and by a further tunnel which is carried through the next hill to Loch Doon. The two tunnels are built with a fall to their junction at the Carsphairn Lane crossing where a valve is arranged on the length of aqueduct connecting the tunnels. When this valve is closed the water from the River Deugh flows through the siphon thus formed into Loch Doon. When the valve is opened water flows from Loch Doon and the River Deugh into Carsphairn Lane.

Under normal conditions the flow from the River Deugh will be passed direct into storage at Loch Doon during wet weather. When the weather is dry and insufficient natural flow is passing to feed the upper hydro stations the valve will be opened to allow flow into Carsphairn Lane from Loch Doon and the Deugh watershed thence to the power stations.

Carsphairn Lane joins the River Deugh at a point three miles further down stream. The flow then passes down the River Deugh a further three miles to a storage reservoir with a top water level of 510 ft. above O.D. This reservoir is impounded by the construction of two dams which have been thrown across the Rivers Deugh and Ken some three miles south of the village of Carsphairn. From the south end of this reservoir near the Ken Dam an open flume has been built which carries the water to the Blackwater Burn, where a further dam across the stream forms the headpond for the uppermost station of the scheme, Kendoon.

From the Blackwater Dam a reinforced concrete aqueduct about three-quarters of a mile in length leads the water to a surge tower thence by a steel pipe line downhill to the power station which is situated alongside the River Ken. The water, after passing through the two turbines in this station, flows down the Ken about two miles to the next station, Carsfad. A headpond is formed by a dam built across the valley and this power station is situated alongside the river a short distance below the dam. From one end of the dam the water is led through twin reinforced concrete aqueducts down the slope to the two turbines in the power station thence it again finds its way back into the river. A further two miles downstream another dam across the River Ken forms the headpond for Earlstoun power station, which is situated about three hundred yards below the dam. A flume leads the water from the reservoir along the hillside to a similar arrangement of twin reinforced concrete aqueducts as at Carsfad, and these convey the water to the two turbines in the station whence it again discharges to the river.

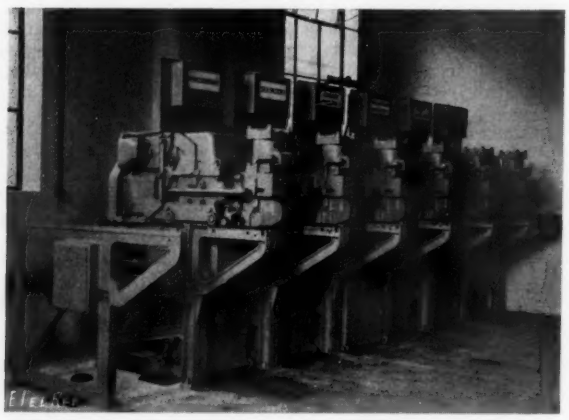
It will be noted that the same water is used by all three of these power stations and at this stage we think that a brief study of them together as a group, apart from the rest of the scheme, is well worth while. The normal maximum heads

for Kendcon, Carsfad and Earlstoun will be 150 ft., 68 ft., and 70 ft. respectively. In each station there will be two turbo-alternators as already noted, and the total capacities of these three stations will be 21,000 kW, 12,000 kW, and 12,000 kW respectively, the head difference, of course, mainly accounting for the capacity difference. The tail-race water from Earlstoun passes down stream to Loch Ken and by the River Dee to Tongland, where the largest station of the scheme is located, 20 miles or so south of Earlstoun and about two miles from Kirkcudbright.

About six miles west of the upper end of Loch Ken, the most important storage reservoir on the scheme after Loch Doon is situated at Clatteringshaws. This loch, at an elevation of 585 ft. above O.D., is formed by the construction of a large dam across the course of the Black Water of Dee near the New Galloway-Newton Stewart road, and a storage is made available of about 1,250 million cu. ft.

Some additional inflow to the loch is obtained from a stream running out of Loch Greenock three miles or so south of Clatteringshaws. This flow is run through a siphon in an intermediate valley whence it is conveyed along a flume into Clatteringshaws Loch.

The water from the loch is conveyed by a tunnel 3½ miles long which emerges on the hillside in the River Ken valley



Switchgear at Tongland (rupturing capacity 100,000 kVA)

opposite St. John's Town of Dalry, and a pipeline down the hill conveys the water to Glenlee power station. This station, along with Tongland, are the only two in the scheme now in commercial operation, and they form the first stage of the company's construction programme. Glenlee operates on a net head of between 360 and 380 ft., and is the highest-head station in the scheme. The tail race canal from Glenlee power station flows into the River Ken about a mile downstream from Earlstoun power station. About three miles further downstream the river enters Loch Ken, a narrow winding loch, about ten miles in length, which is the storage reservoir serving the Tongland station.

At the south end a barrage has been built across the mouth of the loch arranged with a series of six lifting gates. This barrage raises the level of the loch normally about 4 ft. above the natural level and the gates act as a flow control for water feeding to Tongland power station, situated eight miles farther downstream on the River Dee. The river drains Loch Ken to the sea through the estuary of the Dee beyond Kirkcudbright. The storage capacity of Loch Ken between levels 144 and 148 O.D. is about 329 million cu. ft, (approximately 650,000 kWh).

About three-quarters of a mile above the Tongland station a head pond is formed by a dam built across the River Dee from which a reinforced concrete aqueduct varying in nominal diameter between 20½ and 18½ ft. conveys the water to the power station. The capacity of the head pond on a drawdown of 10 ft. between levels 110 and 120 O.D. is about 32½ million cu. ft., representing only about two hours' full power output of the station, which operates on an average head of 106 ft. At the power station the aqueduct terminates under a surge tower about 100 ft. in diameter, from which three pipes 11½ ft. in diameter convey the water to the three main turbines.

The Generating Plant

The turbo-alternators for all the stations are of the English Electric Co.'s manufacture. At Tongland the three main machines are of 11,000 kW rated output, and those at Glenlee are rated at 12,000 kW. They are fitted with the contractors' usual oil-pressure controlled governor arrangements. In addition a mechanical overspeed trip on the turbine main shaft operates on the governor and shuts down the machine in the event of overspeed on the machine as a back up to the oil pressure governor. At Tongland the overspeed trip operates on the governor and in addition by relay operation closes the main valve on each supply pipe, these valves being situated in a building immediately downstream of the surge tower. At Glenlee station the operation of the overspeed trip, besides acting on the governor, closes the cylindrical balanced valve on the supply pipe to each turbine. In this case the valves are in the turbine room.

The Glenlee main machines are fitted with water pressure relief valves on the turbine spiral casings of the machines, as are also the turbines at Kendoon power station in the second stage of the scheme now under construction. These valves are maintained in the closed position under balanced water pressure, and are opened by reduction of pressure on one side of the cylindrical balanced valve through the opening of a subsidiary valve operated mechanically through a dash-pot from the gate mechanism when the turbine gates are closing down. The dash-pot ensures a slow reclosing of the relief valve in order to prevent water hammer taking place in the supply pipes to the turbines under a fairly high pressure.

The Machine Mountings

The weight of the rotating parts of the main turbo-alternators comprising the turbine runner with its shaft, the rotor and the exciter, is taken on a Michell thrust bearing. In addition to a steady bearing incorporated in the thrust itself, the Tongland machines have a further steady bearing immediately above the runner which is fixed to the lower end of the vertical shaft. The Glenlee machines are arranged with two steady bearings, the second bearing in the case of these machines being situated immediately below the rotor. There is the further difference in that the thrust bearing is arranged above the rotor on the Glenlee machines, while at Tongland it is situated below the rotor. The lubrication of the thrust bearings is effected by an oil bath in which water cooling coils are arranged. The steady bearings are served with forced lubrication by oil pumps with mechanical or electrical drive. When starting up the electric pump is run and the feed is taken over automatically by the mechanical pump when the set has run up to speed.

The cooling of the machines is by water taken from the main pipe run through a ring main which feeds the air coolers in the closed air circulation of the alternators and an oil cooler on the forced lubrication system with further connections to the cooling coils of the thrust bearing.

Generation is at 11,000 V. At Tongland and Glenlee the ironclad switchgear for this pressure is arranged in sections with solid walls between them fitted with fireproof doors. The main switchgear is of a rated rupturing capacity of 750,000 kVA, and the local supply switchgear is rated at 100,000 kVA. The switchgear is solenoid operated by remote control from the operating room where there is a miniature control board of the desk type with a mimic layout of the switchgear. Further boards are arranged for machine voltage regulation temperature indication, protective apparatus and local supply metering. The C.E.B. metering of the machines is arranged elsewhere in the stations on a separate board.

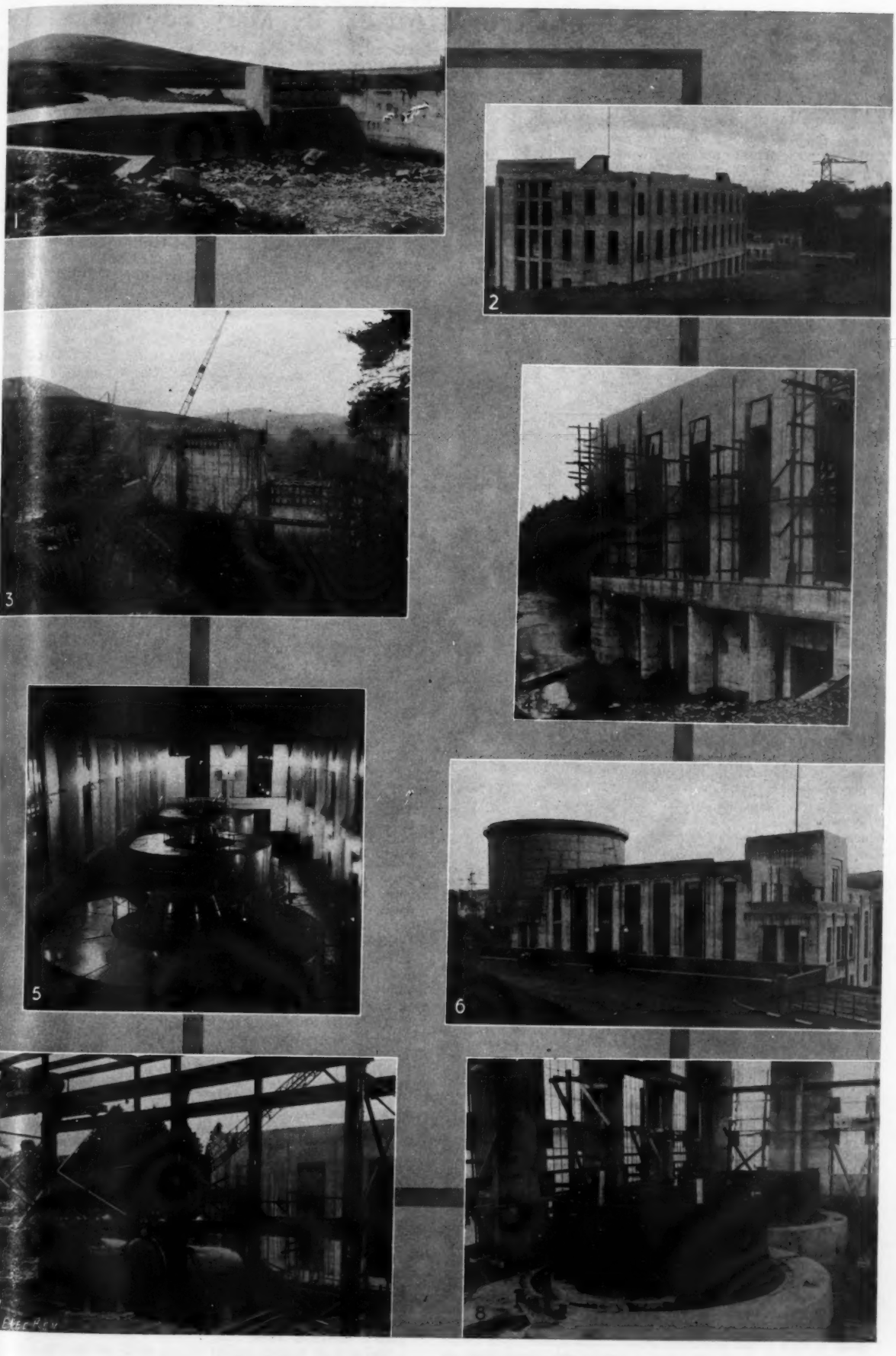
Remote Control

The grid sub-stations alongside the power stations at Tongland and Glenlee, and on the second stage station at Kendoon, are arranged for remote operation of switches from a further control board in the control room. In addition, at the Tongland control room indicating equipment is installed for showing water levels and flows to the station at Glenlochar Barrage, eight miles away, and remote control equipment for operation of the barrage gates is also provided. Similar indication is given for water levels at Tongland Dam and for the surge tower, and equipment for the emergency closing of the intake gate on the dam is also provided.

At Glenlee power station emergency remote closing arrangements are provided for the portal valve at the top end of the main pipe line on the hill above the station at its junction with the tunnel, and for the remote closing of the intake gate to the tunnel at Clatteringshaws Loch. Opening of the portal valve and the intake gate has to be done locally. The control of operation of the new power stations at Earlstoun and Carsfad, which are unattended stations, will also be provided for by apparatus to be installed in the Glenlee control room.

All the power stations are of simple straightforward design in concrete enclosing a steel framework construction of the walls. The main part of the concrete dams at Tongland, Earlstoun, Carsfad and the Rivers Ken and Deugh are of the horizontal arch type in the deepest part of the dam across the river bed with a continuation in dam walls of the gravity type for the remaining lengths of smaller depth. All the other dams are of the gravity type in concrete.

(*Concluded on page* 704.)



The Progress of the Galloway Scheme

1. The stream from Loch Greenock arrested for siphoning. 2. Henlee power station and grid sub-station. 3. The Deugh storage reservoir for the Kendoon, Carsfad and Earlstoun stations. 4. Tail-race side of the Kendoon station. 5. Interior of the Tongland station at night. 6. The Tongland station, showing the surge tower. 7. Kendoon station under construction; valve house frame and turbine inlets in foreground. 8. The Carsfad alternators under construction.

A Small All-electric House. By Mary Edwards

Compact and labour saving arrangements

AN all-electric house has been built on the Manchester to Blackpool main road at a total cost of £650, including equipment. The house is not large, having a dining room and lounge each 12 ft. by 13 ft. and a kitchenette 8 ft. by 9 ft.; three bedrooms and a fairly large bathroom comprise the upstairs premises. The idea in building the house was to utilise all available space and to make the place as labour-saving as possible.

The lounge and dining room both face the road, standing back about 35 ft. The lounge has a big bay window and the dining room a french window opening on to the lawn. Both rooms have fitted electric fires, the fireplace in the dining room being convertible for use as an open grate in case it is desired to sell the house at some future date. In the lounge there is also a tubular heater fitted under the window. Both rooms have bakelite bracket wall lamps fitted on each side of the fireplace, while the lounge has two more fitted on the opposite wall and an octagonal ceiling fitting. In the dining room there are two extra lamps fitted, one over the sideboard and another above the serving hatch, while a three-light chromium-plated fitting hangs in the centre of the room over the table.

The lounge and kitchen of the all-electric house described in this article

In the kitchenette there is an electric refrigerator which is automatically illuminated inside when the door is opened. Next to this is a big cupboard and opposite it a tiled sink fitted into the window recess. Between the cupboard and the sink is another window facing north, and under this is a plain table for cooking, ironing, &c. In the corner of the window sill is a plug for use with the iron, percolator, kettle, or toaster. This plug can also be used for the electric washer, which when not in use fits under the table. Opposite the refrigerator and between the door and the sink is the electric cooker, over which is a lamp with a plain white shade; there is a similar fitting over the table.

The hall and stairs are warmed by two tubular heaters, one in the hall and the other on the landing. There are lamps in the hall and on the landing and in addition there are two wall brackets, similar to those in use downstairs, placed one on each side of the stair window.

No fireplaces are provided in the bedrooms, which have ventilators fitted high up in the walls. Each room has its own electric fire fitted into an asbestos panel which matches the colours of the room and which is fastened across one corner. In each room there is a lamp over the head of the bed and another over the dressing table, both of which can be switched off from the bed. In the largest room there is a third lamp fitted into the big bay.

The bathroom is half tiled and an electric towel rail is fastened to the wall along the top of the tiles opposite the bath. Over the shaving mirror is a long candle fitting placed horizontally. The fire is in the corner of the ceiling opposite to the bath, and shines down on it, thus ensuring warmth without danger. The water for the whole house is heated by a "Circstat" fitted into the hot-water cylinder. This is automatically switched off when a fire is lighted or when the water gets to a certain temperature.

All the house cleaning is done by means of an electric cleaner and polisher, for which plugs are fitted near the fireplace in each room and, of course, in the hall and on the landing. There is an electric fan in the hall which is in use all day during the hottest part of the year, and this seems to affect the temperature of the whole house.

A horizontal fitting over the recess above the front door shines down on anyone standing on the steps, and also lights up the drive to the outer gate. A small light is fitted outside the french windows and another over the back door shines on to the kitchen garden.

We have found that, on the whole, the house is run much more cheaply "all-electrically," the average cost, summer and winter, being about five shillings a week. The cleaner and polisher are used daily, and an all-mains radio set is often working throughout the day. In the summer the electric iron is used almost every day for thin frocks and shirts, &c. The radiators in the bed and bath rooms are used about an hour each day and the dining-room fire is switched on during the morning and for meals, while that in the lounge is used in the evenings.

One of the outstanding benefits is that the house is much cleaner, for there are no blackened ceilings and no smoky fires making dust all over the house, while as a result of the careful planning work is reduced to the minimum.

The Galloway Scheme (*Continued from page 702*)

A spillway is provided at each dam for disposing of excess water during storms, and at the Tongland and Earlstoun dams storm gates are provided with a limited length of spillway for dealing with excess storm water flows. For emptying the various reservoirs needle valves are arranged in the main dam on the downstream side with an emergency gate on the upstream side for use when it is necessary to do maintenance work on the needle valves. The Tongland floodgate and spillway are illustrated in the block which is at the head of this article.

The turbine rooms of the power stations are floodlighted by specially designed wall lanterns glazed with flashed opal glass of high transmission efficiency. These lanterns are spaced at column centres on either side of the turbine room and are fitted internally with reflecting mirrors which, together with the diffusing glass, give a well-balanced and uniform illumination throughout, entirely free from glare.

The operating room is illuminated by direct lighting from opal glass rectangular fittings of the totally enclosed type mounted close to the ceiling. Similar fittings of the pendant type are provided in the offices.

The normal supply is given in duplicate at 110 V a.c. from separate lighting transformers. Switching facilities are provided for changing over all of the lighting to the d.c. battery if required and there is an emergency lighting system.

In the Tongland engine room there are twenty-six 300-W lanterns and 172 other miscellaneous fittings from 60 to 150 W. In the Glenlee engine room there are nineteen 300-W lanterns and 107 miscellaneous fittings. The fittings are made by M. L. Hill, the Edison Swan Co., Ltd., Holophane, Ltd., the General Electric Co., Ltd., Benjamin Electric, Ltd., Dorman & Smith & Ascog, Ltd.

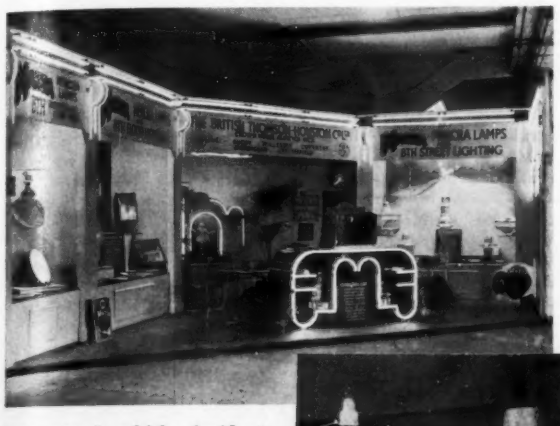
The C.E.B. sub-station at Tongland is on the Carlisle-Kilmarnock grid line and incorporates, it is claimed, the first 132-kV metal-clad switchgear to be installed in this country. This was manufactured by Messrs. A. Reyrolle & Co., Ltd.

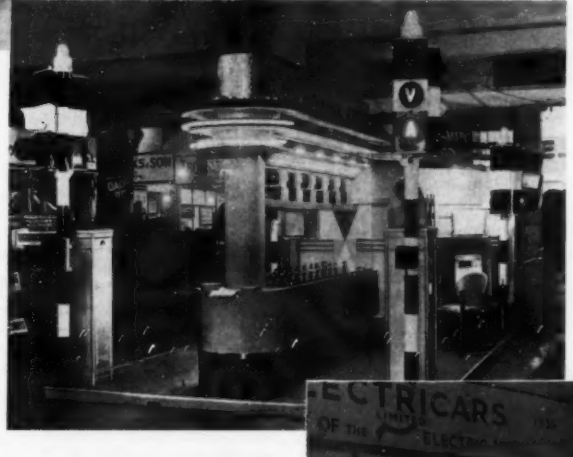
The consulting engineers for the scheme were Messrs. Merz & McLellan and Sir Alexander Gibb & Partners.

The Public Works Exhibition

Electricity's part in promoting road safety

THE realisation of the fact that dangers on the road can be considerably reduced by the provision of efficient street lighting together with traffic control devices is responsible for a very marked interest being taken in these matters at the Public Works, Roads and Transport Exhibition now being held at the Agricultural Hall, Islington, London. Many notable improvements in street-lighting equipment have made their appearance within the last year or so, and one of the most interesting exhibits from the street-lighting engineer's point of view is to be seen on the British Thomson-Houston Co.'s stand. This is the "Mercra H" lantern designed to accommodate a standard "Mazda Mercra" lamp in a horizontal position. On the same stand—which, incidentally, decorated with architectural tubular lamps, is one of the most attractive in the exhibition—are the latest types of lantern for use with "Mazda Mercra" and gasfilled lamps, "Mazdalux" floodlights and a representative selection of available electric-discharge lamps.





Among a wide range of Siemens electric-discharge lamps now made is the "Sieray-Dual" lamp which operates direct off the mains without choke or condenser, other items of interest being control apparatus for electric-discharge lamps, floodlights of various types, and examples of gasfilled, series burning, projector, traction and traffic signal lamps.

Fascinating working models are attracting many spectators to the Automatic Electric Co.'s two stands. On the one in the entrance hall is depicted a length of road containing a series of six intersections, each controlled by its own local controller. Instead of linking these controllers together by a master timer as in the past a new method has been evolved termed "repeated detector impulsing," its purpose being to take the utmost advantage of the "reservoir" space between each intersection. Thus traffic crossing the detector at one intersection, not only announces its presence there but passes on a warning of its imminent arrival to the next intersection. In the same model is demonstrated another recent development, the control of pedestrian crossing signals by means of photo-cell and light beam.

Remote Control of Public Lighting

The other model mentioned is on the company's exhibit on the balcony and illustrates the remote-control "Strowger" system for controlling public lights. It consists of a large clock dial having three panels inset. Each panel contains a picture of a street scene and when the moving fingers of the clock reach the appropriate times the street lights and daylight are effectively represented. Other Automatic Electric Co. exhibits include a private automatic branch telephone exchange and an A.T.M. street fire-alarm apparatus. A fire-alarm indicator is also shown by Amcolite, Ltd., who are, in addition, featuring their new "Silver Ghost" illuminated bollards and signs.

In conjunction with its associated company, the Siemens & General Electric Railway Signalling Co., Ltd., the General Electric Co., Ltd., has an illuminated map demonstrating the operation of the "Autoflex" co-ordinated vehicle-actuated traffic signals. The rest of the G.E.C. stand is devoted mainly to various types of modern street-lighting fittings (including several for use with the "Osira" electric-discharge lamp), traffic bollards and floodlighting equipment. The "Osira" angle reflectors are proving very popular for the exterior lighting of garages, &c.

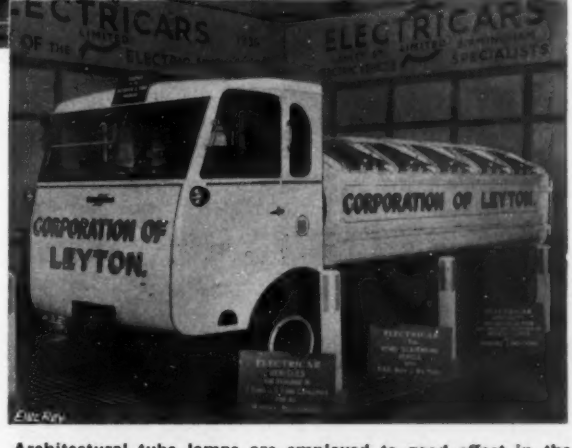
The "L.S.E." vehicle-controlled traffic signals shown by I.R.S., Ltd., are operated by road detector pads of unusual design and are claimed to be exceedingly simple to install and maintain. Motorists are given ample warning of the change of the colour signals by the use of the part-time flicker lights shown by Messrs. Hailwood & Ackroyd, Ltd., who also have a very large display of street-lighting fittings and glassware, illuminated refuges and posts, safety lamps, &c. Illuminated refuges, bollards, guard posts, &c., are also displayed by Gowshall, Ltd.; the Cardiff Foundry & Engineering Co., Ltd.; Taylor Bros. (Sandiacre), Ltd.; O. C. Hawkes, Ltd., and the Franco-British Electrical Co., Ltd.

Neon "Spectrum" Lighting

As a separate exhibit on the stand of the last-mentioned company is a room illuminated solely by neon "spectrum" lighting. As our "unretouched" photograph on page 706 shows, the lighting is shadowless, and another important feature is that the objects in the room retain their true daylight colours. For the cornice lighting two pastel blue tubes and one red are used behind a white frosted-glass screen; green and red tubes are concealed in the central box fitting. This is claimed to be the first time neon tubes have been employed for interior illumination, and the soft coloured lighting effect produced seems particularly suitable for such places as restaurants, cinemas, &c. For the room shown, which measures 15 ft. by 7 ft., the electricity consumed is ¾ kWh per hour.

Time switches are well in evidence on the stand of the Horstmann Gear Co., Ltd., who supply 15-, 21- or 40/42-day hand-wound, synchronous motor drive or electrically wound with reserve spring movements. There is a new model for low-rate window lighting and also one suitable for illuminated street refuges.

A floodlighted canopy panel



Architectural tube lamps are employed to good effect in the British Thomson-Houston Co.'s street-lighting exhibit (top). On the Automatic Electric Co.'s stand (centre) the most interesting exhibit is a large model traffic signal installation. Our remaining picture shows one of nine "Electricar" scavenging vehicles supplied to Leyton Borough Council

carrying typical flush-mounted instruments is the principal item shown by Electroflo Meters, Ltd., who also have a working model in section of an electrically operated Venturi meter, a pedestal type meter body for open channel flow measurement, a recording liquid-level gauge and a display of temperature and pressure recording and regulating instruments. New types of electrical transmitting apparatus for weirs and flumes and a battery-operated impulse-type reservoir-level recorder are demonstrated by the Lea Recorder Co., Ltd.

Among exhibitors of oil, petrol and Diesel engines and

Low-voltage Neon Tubes. By David Krestin, B.A.

Towards standardisation and mass production

NEON lighting, which comprises the use of discharges through a wide variety of gases and vapours, has very rapidly become one of the most characteristic and widespread features of modern advertising. Yet the gas-discharge tube, discovered by Geissler and the subject of much study long before the invention of the incandescent lamp in 1878, has not really emerged from its development stage.

Although neon tubing to the value of over £500,000 is sold every year in Great Britain alone, this is insignificant in comparison with the potential market; nor are the neon tubes at present manufactured standardised in the sense in which this term may be applied to the incandescent lamp. Each neon sign or decoration is still an individual product, designed, manufactured and maintained according to the individual customer's needs. Until recently it was considered that the reasons for the anomalous state of the neon-tube industry were inherent in the physical properties of the light source. The erroneous nature of this view, however, has now become apparent.

When Moore, realising the theoretical advantages of a gas-discharge light source, commenced his researches in 1895, helium, argon and neon were not obtainable at prices which rendered their use commercially feasible. Argon was obtainable at a commercial price much earlier than the other two gases, but its luminosity was relatively poor. Consequently Moore concentrated his efforts for twelve years on the gases which appeared, at the time, most promising, namely, nitrogen and carbon dioxide. Nitrogen gives a pleasant, soft golden-yellow light, while carbon-dioxide light very closely resembles daylight. On the other hand, these gases are readily absorbed during the passage of the discharge and possess a very high resistance. Moore was, therefore, compelled to develop special gas-feeding valves and to employ voltages of 10,000 or more to obtain a satisfactory positive-column glow lamp. Consequently the Moore light, although successfully launched on a small scale over twenty years ago, has failed to make headway.

Claude, having evolved a method of commercial extraction of neon, produced in 1910 the first positive-column glow discharge tube and established the advantages of neon. As neon is not readily absorbed and has a high conductivity, Claude was able to dispense with the feeding valve and to reduce the operating pressure from 10,000 V to from 1,000 V to 3,000 V per tube section. These advantages and the much higher luminosity of neon compared with common gases gave an enormous impetus to gas-discharge tube lighting; even to-day neon-filled tubes constitute about 80 per cent. of the tubes manufactured.

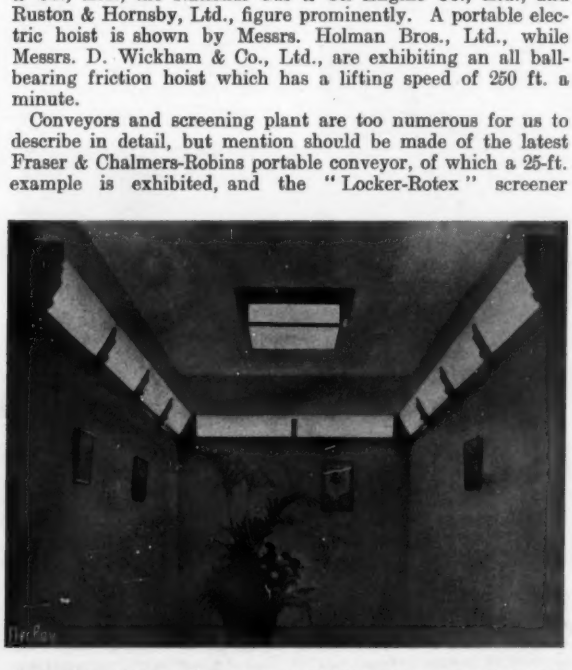
Presently the need for colours other than neon red became manifest. Claude first proposed the use of mercury vapour in combination with neon. This led to the development of discharge tubes giving blue and green light; the difference between the two was only the use with the latter of a coloured glass envelope which served partly to suppress the blue lines of mercury while transmitting the yellow and the green lines, and partly to transform the shorter wave lengths to green and yellow-green by fluorescence. Discharge tubes containing helium and giving a yellow light containing helium and mercury and giving a rather indifferent approximation to white light were also made. All these tubes, like those containing neon, nitrogen or carbon-dioxide previously produced, utilise the positive-column glow and require high voltages for their operation.

Attempts to introduce neon-tube lighting for interior decorations have been unsuccessful owing to the objections to the use in public buildings of high voltages, but three fields of exploitation of at least equal importance are open. The largest of these, external signs and decorations, continues to absorb ever-increasing quantities of neon tubing with every indication that its maximum potential demand has not yet been approached. The second field is that of shop window displays; these are slowly becoming more popular, but objections to high voltages have, so far, kept the demand at a small fraction of its ultimate probable value. The third field, that of interchangeable signs, such as cinema programme

The Public Works Exhibition (*Continued from preceding page*)

pumping plant, Messrs. R. A. Lister & Co., Ltd., Blackstone & Co., Ltd., the National Gas & Oil Engine Co., Ltd., and Ruston & Hornsby, Ltd., figure prominently. A portable electric hoist is shown by Messrs. Holman Bros., Ltd., while Messrs. D. Wickham & Co., Ltd., are exhibiting an all ball-bearing friction hoist which has a lifting speed of 250 ft. a minute.

Conveyors and screening plant are too numerous for us to describe in detail, but mention should be made of the latest Fraser & Chalmers-Robins portable conveyor, of which a 25-ft. example is exhibited, and the "Locker-Rotex" screener



A new type of neon "spectrum" lighting demonstrated by the Franco-British Electrical Co., Ltd., at the Public Works Exhibition (see p. 705), has possibilities for the interior lighting of cinemas, &c. It is shadowless, does not interfere with the true daylight colour of objects, and has a very low consumption

shown for the first time by Messrs. Thomas Locker & Co., Ltd. Electrically operated concrete mixers are to be seen on the stands of Messrs. Pegson, Ltd.; Ransomes & Rapier, Ltd. (who also have a model of a large electric shovel); and Millars' Machinery Co., Ltd. Asbestos-cement piping shown by Turner's Asbestos Cement Co., Ltd., is finding increasing application, while electric wiring of power stations, factories, engine rooms, &c., is considerably simplified by the use of "Harco" perforated metal cable plates supplied by Messrs. G. A. Harvey & Co. (London), Ltd., who, incidentally, are now doing a big trade in metal electric-heater covers.

Electric Scavenging Vehicles

Electricars, Ltd.—to our surprise the sole representatives of the electric battery-operated vehicle present—show one of nine scavenging vehicles made for the Leyton Corporation. It is an entirely new 2-ton model fitted with a 7½-cu. yd. all-steel body with domed covers removable in two sections. Electro-hydraulic end tipping gear is provided. The vehicle has a maximum speed of about 16 m.p.h. and will run thirty miles per charge. Mr. J. W. Treece, director of the company, tells us that to cope with the increasing demand for "Electricars" the company hopes to open showrooms in London in January.

Various types of electrically operated tools are displayed by Micox Electrical Equipment (new tile grinders and portable electric saws); the Flextol Engineering Co., Ltd.; the Climax Rock Drill & Engineering Works, Ltd. (hot milling machine for milling drill bits); and the British Equipment Co., Ltd. (saws and drills for chases for electric conduits, and electric hammers). Tecalemit, Ltd., has a complete range of lubricating equipment and accessories.

The exhibition closes to-morrow (Saturday).

Large Electric Furnaces

THIRTEEN big bell-type electric furnaces are to be installed by the General Electric Co. of New York, in the Rouge plant of the Ford Motor Co., where, in conjunction with twelve other bell-type furnaces built by another manufacturer, they will be used to anneal steel strip. Each is of sufficient capacity to bright-anneal, in one charge, two 16,000-lb. coils of steel strip 48 in. wide, 52 in. outside diameter, and 30 in. inside diameter. The annealing cycle lasts for forty-five hours, much shorter than with conventional fuel-fired equipment. There will also be installed two combustion-type furnace-atmosphere controllers, each rated at 2,000 cu. ft. per hour and equipped with auxiliaries for purifying the gas. The furnaces are each rated at 230 kW. The charge of strip to be annealed is covered by a sheet-alloy retort, and this in turn is covered by the bell furnace. Controlled atmosphere is maintained within the retort, surrounding the charge. Heat is supplied by heating elements in the side walls and by a central element which extends from the roof of the furnace down into the hole in the stack of coils. Even distribution of heat and acceleration of the heating and cooling cycles are assisted by various means.

announcements, is very promising but comparatively little exploited, since the high voltages employed make interchanges complex and consequently costly.

Such discharge tubes require special transformers combining high-voltage output with low regulation for controlling current surges due to the peculiar current-voltage characteristics of the tube. High-voltage wiring, fireman's switches and special insulation are necessary. Furthermore, where the supply is d.c. a rotary convertor is required. All this necessitates highly skilled labour in installation and maintenance. The manufacturers are, therefore, obliged to employ experts not only for the erection of a neon sign but also for maintenance during its working life. Customers, quite naturally, desire assurance of satisfaction, and this has led to a system of hire-purchase contracts covering maintenance. It is not advantageous, however, for a firm to supply and maintain a neon-tube installation at some distant place. Furthermore, the original basic patents relating to high-voltage discharge tubes are no longer in force Consequently a large number of firms, all in keen competition, have sprung up, each operating, as far as possible, within a small radius.

Absence of Standardisation

The above circumstances, and the need to treat each sign as an individual problem in view of the complexity of installation and maintenance, have resulted in an almost complete absence of standardisation such as obtains in the mass-produced electric incandescent lamps. Hence the neon industry, in spite of its large turnover, is still in the craftsman stage in which increased output does not mean cheaper production and in which a small, intelligently run firm may be better off than a large one since its overheads are lower.

It has been realised for some years that standardisation and mass-production can only be achieved by constructing discharge tubes capable of operating direct off the household supply, whatever their shape and size. The problem has been attacked in several ways. One method, for a long time considered to be the most promising, was the provision of positive-column glow discharge tubes with highly efficient electrodes. In this method the cathode fall-of-potential is reduced to a low value either by employing as cathode material a substance wholly or partly composed of or coated with elements or compounds of elements of low thermionic work function, or by cathode preheating by means of auxiliary current, or by a combination of the two.

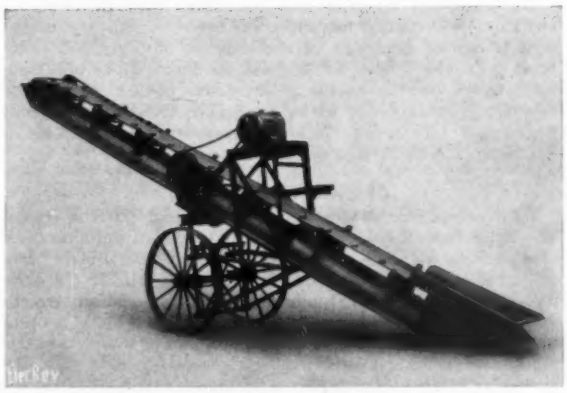
The dependence of cathode fall-of-potential on cathode material was demonstrated by Mey in 1903. The reduction of cathode fall-of-potential with increase of cathode temperature to and above red heat was observed still earlier. Alkali and alkali-earth electrodes were employed by the Moore-Licht Akt.-Ges. in 1913, and there have been numerous subsequent improvements in both electrode material and in the construction of preheated cathodes. Probably the most important developments were achieved by A. W. Hull in 1927 and by A. W. Hull and W. A. Ruggles in 1928, whose hot cathodes have been acquired in this country by the B.T.H. Co.

The importance of these developments is shown by the cathode fall-of-potential in neon for a cold-tungsten electrode being about 125 V while in the same gas for a cold-nickel electrode coated with barium oxide it is only about 50 V and for a hot cathode in neon-helium less than 20 V. On the other hand, the increased efficiency of the cathode has failed to obviate the need for high operating voltages in positive-column discharge tubes, nor can it be expected to do so, since it does not materially affect the drop in the positive column itself.

Since the voltage necessary to initiate a discharge is considerably greater than that required to maintain it, various means have been tried to facilitate the starting of the discharge. Among the most important methods, that of starting by means of a high-voltage surge generated by an auxiliary inductance (due to Cooper Hewitt) has the disadvantage that it cannot be applied to the restarting of an a.c. discharge following its extinction at every half-cycle. Two other methods of starting, both developed in 1919, one by Pintsch and the other by Philips, are effective. The Pintsch method utilises the capacity effect between the gas within the tube and a strip of tinfoil on its exterior, while the Philips method employs internal starting electrodes suitably situated with respect to the main electrodes. Neither method, however, achieves more than the approximation of the voltage required to initiate the discharge to that necessary to maintain it.

The use of hot electrodes incorporating or coated with compounds of elements of low thermionic work function, in conjunction with effective starting means, has permitted the production of straight, relatively short tubes of relatively large diameter, capable of operating direct off the household supply and possessing high luminous efficiency and long life. Such tubes are admirable for certain special purposes. They do not, however, satisfy the requirements of the sign and decoration industry, in which tubes of relatively much smaller diameter and greater length, bent into complex shapes, are principally used. Nor is there any reason to believe, in view of the physical properties of the positive-column glow discharge, that they will ever do so.

The problem has been tackled in a rather different manner by investigators who were impressed by the possibilities of high-frequency currents, and positive-column discharge tubes so operated were produced by the Moore-Licht Akt. Ges. in 1912. Since then important work in this field has been done by E. V. Hayes-Gratze in 1923, by T. E. Foulke in 1926, by D. P. A. A. Kayser in 1927, and others. While interesting results and some beautiful effects have been produced the method has inherent disadvantages which limit the scope of



The Fraser & Chalmers-Robins portable conveyor shown at the Public Works Exhibition **(See page 705)**

its application. In the first place, the h.f. current generator, even under the best circumstances, is an undesirable complication. While offering certain advantages with d.c. supplies, it cannot compete with the high-voltage transformer and wiring for a.c. supplies. In the second place, the use of a h.f. generator makes the whole system even less amenable to mass-production methods than it is at present.

Apart from this, there appear to be practical difficulties in construction of any signs other than those of the narrowest tubing and having letters only a few inches high. Finally, the h.f. currents are apt to create undesirable radio disturbances and, owing to inadequate insulation, add to the fire risk.

The Negative-glow Discharge

The possibility of utilising the negative glow as a light source was explored by M. Schmierer in 1913, and in 1918 the G.E.C. of America produced negative-glow lamps operating direct off the household supply. The obvious advantage of the low operating voltage of negative-glow lamps appealed to investigators, but the difficulties of obtaining adequate luminosity and of producing tubes of relatively small diameter, great length and complex shape discouraged further investigations in this field for many years.

Recent researches in Great Britain appear to indicate a satisfactory solution of the problem. This lies in the adoption of the negative-glow discharge with a mode of construction that fulfils the necessary conditions of increased luminosity and the adaptation of this type of discharge to long tubes bent into complex shapes. No special starting means or auxiliaries other than ballast resistances, which may be integral with the tubes, are employed, and tubes of any length can be bent into all sorts of complex shapes. The colours so far produced include an orange-red, a gold, a blue, a green and a white. Tests carried out by an independent institution show that these tubes have a satisfactory life, throughout which their behaviour is consistent, and that their consumption is of the same order as that of the positive-column discharge tubes.

While the positive-column discharge tubes appear to be equally bright when viewed at a distance or at close quarters, these negative-glow tubes, owing to the peculiar distribution of the discharge, appear considerably brighter at a distance than at close range. This has the advantage of enabling a combination of the higher luminosity calculated to attract at a distance with the lower luminosity that permits pleasing contemplation at close proximity.

The disadvantages possessed by these tubes at present are their unsuitability for signs comprising letters less than five or six inches high, and the temperature of the glass envelope which becomes unpleasantly hot during operation without reaching 100 deg. C. Tests have shown, however, that there is no tendency for them to fail when they are exposed to bad weather.

Wiring Systems. By H. R. Taunton, A.M.I.E.E.

Further notes on the new I.E.E. Regulations

THE section of the tenth edition of the I.E.E. Wiring Regulations dealing with bare conductors (Rule 402) is not one that will interest the average contractor, who only installs them occasionally, on the back of main switchboards or in battery rooms. One or two firms have successfully experimented with a system of bare copper rods run in special chases, as the main risers of large blocks of flats or offices. Others, attempting to follow their example without their special experience, will usually find that the cost of special insulating and isolating devices, and of complying generally with the several clauses of Rule 402, will outbalance any saving on more ordinary methods.

The possibility of using bare conductors throughout an installation is certainly tempting. One plays with the notion of a system of ducts left in the concrete of floors and partitions into which bare wires could be drawn from one insulated outlet box to another. There are obvious difficulties, however, probably not to be overcome; bulk, for instance, since each wire would need its separate duct, and lack of flexibility, for alterations or extensions.

Cleat-wiring Methods

V.i.r. cables run on cleats make a safe and efficient system of wiring factories, sheds and the like, where appearance is a minor consideration. It was an economical system, too, when carried out in accordance with the old Rule 87 (L), now replaced by Rule 403. This has one or two variations which, seemingly trivial, will in many cases have the effect of making this system almost prohibitive in cost. This is a pity, because in its own sphere it is a good and useful system, with the particular merit of being open and above board. By the old rule the cable had to be spaced from structural surfaces only in damp positions. Now (Clause C) they must be so spaced in all positions. A strict reading of the clause would bar the use of standard porcelain cleats, as they are not deep enough, unless very closely spaced, to prevent the cables "coming into contact with walls," &c., by natural sagging.

Another new requirement is even more impractical: that isolated metal bushes at floors, partitions, &c., shall be effectively earthed (Clause F). In many of the kind of buildings which might suitably be wired on this system this would entail running an extra earthing wire practically throughout the installation. It is to be hoped that this requirement will be deleted when Rules 1001 (in which it is again noted) and 1002 are amended to meet the universal criticism of their complications.

Clause G of Rule 403 is also a new addition, but it may be ignored. If it be carefully read in conjunction with Clause A it will be seen to be redundant. Clause A says, in effect, that unprotected cables must not be run under floors or within partitions "except as provided in Clause G"; but Clause G only repeats wordily that cables run under floors and within partitions must not be unprotected! This Clause A, of course, bars the threaded-joist wiring popular in America and with jerry wiremen here. It was, a few years ago—it may still be—the standard under the assisted wiring scheme of at least one large corporation.

The Flex Problem

Rule 405, dealing with flex used for "fixed wiring," is very similar in the details of its clauses to Rule 403. One curious difference is in Clause H (corresponding with 403F), dealing with the bushings of floors and partitions. In 403F these are described as "metal or other non-absorbent conduits," whereas in 405H there is no allusion to "metal," and as a consequence the earthing requirement criticised above is omitted. Is the intention to prohibit the use of metal bushings for flex? But a length of steel conduit used for that purpose would comply with the clause, being "non-absorbent and incombustible."

Personally, I think it a pity the Wiring Rules should give countenance to the use of flex for permanent work in any circumstances. True, an extension in flex is often a convenience. There are few contractors who have not such extensions in their offices or showrooms—probably infringing one or more of the eight clauses of Rule 405. It would be, indeed, a fairly safe bet that somewhere in the Institution building itself might be found a handy length of wiring in flex. But if people will prefer an easy economy to a solid, permanent job, let them do it on their own responsibility. They can always salve their consciences by calling it "temporary" until it breaks down from old age.

Rule 406 is pretty much the same as the old Rule 87 (M1. M2 and R), but a new and useful feature is the table in Clause D giving the maximum spacing allowable for the fixing of various sizes of lead-covered cable. Contractors who pride themselves on good work have always approximated to these figures, to comply with 87 (ix). Others, with whom l.c. wiring is popular for its supposed cheapness, may, when they are forced to abide by the new clause, be disagreeably surprised to find that the labour of plugging hard surfaces, such as concrete, for numerous fixings, will bring the cost of their pet system to a figure comparable with that of screwed conduit.

In Clause I we are introduced to the new limit of electrical resistance of the earthing system for all installations, whether carried out in metal-sheathed cables or in conduit (cf. Rules 408J and 1005), *i.e.*, 1 ohm. This is twice as stringent as the old rule, but, as in normal practice the lower limit presents no difficulty to good workmanship, there is nothing to cavil at in it.

Clause A of Rule 407 is new. It prohibits the exposure of c.t.s. cables to direct sunlight. There are many who use this type of cable, so well adapted for outdoor work, who do not realise the deleterious effect of sunlight on "hard" rubber. On most theatre and cinema canopies in the country may be seen lengths of exposed c.t.s. running to floodlights. The difficulty is easily got over, apart from using conduit, by braiding and compounding the cables.

The first clause of Rule 408 (on conduits) is a reference to Rules 1319-1322. The reference is important, for 1319 prohibits the use of light-gauge conduit for voltages above 250, *e.g.*, wiring for a 400-V, 3-phase motor must be run in heavy-gauge. This would have been better emphasised by noting it under Rule 408, as it is a point of "installation" and not of "construction"—the subject of the rules in Section L13. There is certainly Rule 413, but that is not helpful. It rather contradicts 1319 by saying that the "heavy-gauge" conduit of the latter must be "screwed," and it is weakened by a vague alternative, which could be interpreted by a conscienceless contractor so as to stultify the whole purpose of the rule.

Combating Condensation

An amendment to Clause D (dealing with that bugbear of conduit work, condensation) makes it clear that ventilating (and drainage) outlets are allowable in conduit if "suitably placed"—a vague condition which it has to leave to technical experience. Unfortunately, the rule does not go on to tell us how, in the shallow floors of modern carcase work, we can so install our conduits as adequately to drain them!

Clause F, by its reference to Rule 617B, definitely allows conduit to end in surface wood blocks. Does it also allow conduit to end in flush wood switch-boxes, so commonly used in cheap work? As a matter of fact, it says nothing, specifically, about the ends of conduit at flush switch or socket points, except that they must be "screwed or adequately clamped to accessories"—an impossibility if one considers the actual switch or socket, and not its containing box. Perhaps Clause K is intended to cover the point, as it might be argued that any outlet box is necessarily also a "draw-box." Incidentally, most of Clause K is a repetition of Rule 1320, and one or the other is therefore superfluous.

As it stands, the wording "a device clamping both sides of the wall of the box"—which normally means bushes and locknuts—would prohibit the use of grip continuity fittings with heavy-gauge conduit; a possible system, sometimes used. and allowable by Clause J and its note. Clause N and the corresponding Clause F to Rule 411 (dealing with wood casing) are new and worth noting. So is the table under Clause D of the latter rule, giving the maximum number of cables of various sizes which can be run in one groove of casing.

The last Rule in this section, 414, deals with the installation of electric bells and similar apparatus. As a matter of convenience it would have been better to have collected together all the rules dealing with this class of work, *e.g.*, Rule 210, isolated in an earlier section. And it would have saved space; for all the clauses of Rule 414 will be found repeated, almost word for word, in a later Rule, 711.

The "Civils" New Journal

The first number of the "Journal" of the Institution of Civil Engineers appeared on November 15th. The first volume of "Transactions" was published in 1836 and the "Minutes of Proceedings" have remained unchanged for ninety-eight years, now constituting 240 volumes. The new "Journal," while maintaining continuity with previous publications, will permit earlier publication of papers read and wider dissemination of the reports of the Institution's Research Committee. The "Journal" is to be issued on the 15th of November, December, January, February, March, April, June and October at 2s. 6d. per copy.

Rural Distribution Costs

Mr. W. Fennell suggests measures by which the return upon capital may be improved

IN his address as chairman of the Transmission Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 13th, MR. W. FENNELL reviewed rural development with a view to indicating possible ways and means of reducing costs. He said that the ideal to be aimed at was a uniform price in town and country, not by subsidising the latter by the former but by lowering the cost of overhead line construction to equalise the costs of distributing overhead in the country and underground in towns. Regulations had been eased and obstructions removed, but only pioneers with sufficient enthusiasm to regard cost reduction as a hobby had escaped heavy over-capitalisation on overhead work.

Another step towards cheap rural supply was the adoption of single-phase h.v. and the rejection of four-wire l.v. distribution in the smaller villages and farming districts. The former system could cost under £200 per mile, and voltage regulation was good, whereas the latter must cost over £400 per mile and regulation was very poor. Given cheap single-phase lines, single-phase transformers, and single-pole insulation, switching, and fusing, the serious problem of capital cost was capable of solution.

This economy had been obtained by the Mid-Cheshire E.S. Co., Ltd. (of which the author is general manager and engineer), by the unusual expedient of earthing one phase (instead of the neutral) of branches from the 33-kV main layout, with pin insulators on "A" poles, interconnecting the small towns and largest villages *en route*. The 6.6-kV three-phase sub-mains passing near the larger villages had one phase line earthed and two "live." This reduced the cost of insulation and needed only s.p. switches for single-phase and d.p. fuses for three-phase tappings. The 6.6-kV single-phase spurs to small villages and remoter farm areas had s.p. h.v. insulation, switching, and fuses. Expensive four-wire distribution was used only in a few large and compact villages.

One of the difficulties encountered by the mains engineer in Northwich. A breach in a roadway due to the falling-in of an abandoned salt mine

Wiring, cookers, water-heaters, and wash-boilers were hired out, and larger special appliances disposed of by hire-purchase. There was a good central showroom and an active contracting department. By maintaining high flat rates 95 per cent. of the domestic and farm loads had been obtained on a two-part tariff with a low kWh charge, which encouraged successive additions of extra apparatus, even in the rural areas. By these means the company had been able to develop its area of 160 square miles economically on a uniform tariff for town and country.

The few large single-phase motors on branch rural lines had cost 50 per cent. more than their three-phase equivalents would have done, but their owners were compensated by lower energy charges. A new off-peak load was developing for sterilising milk, and even these loads could be carried on "tail ends" with a h.v. system.

Late-comers who had avoided the 1919-29 expensive constructional decade should find it very easy to deal with rural areas on an economic basis if they ceased to copy in the county the system used in small towns. The l.v. four-wire system of distribution would not deal with prospective rural demands. Many areas would soon find it necessary to superimpose 33-kV mains upon their existing 6.6- and 11-kV networks.

Similarly, in cities l.v. distributors were becoming too large, or inconveniently numerous in parallel, to serve blocks of multi-storey buildings. This indicated a reversion to the pre-1890 "house-to-house" system of individual transformer sub-stations with "in-out-and-tap" h.v. switching sets. Existing general 6.6-kV/400-V sub-stations would then need to be stepped up to 33/11/6.6-kV.

Could anything substantial be done so to reduce the cost of 11-kV cables as to make them competitive for rural work? There was reason to believe that existing standards of h.v. cable insulation were too high. Less radial thickness would serve by adopting voluntarily for 11-kV some of the simpler and cheaper precautions that had become necessary for 20-kV and over. A perfectly good plain lead-covered 11-kV cable could be made at a price 20 per cent. less than the "current" B.S.I. figure, with little, if any, reduction in reliability. Also cheaper methods of laying might be adopted.

The rapid increase of domestic load would render present ideas of l.v. distribution obsolete in a few years. Reference was made in the address to potential gradients in different soils in the vicinity of earth plates, and to the greater sensitivity of cattle to shock than human beings.

The curious effects on buildings and underground cables resulting from soil subsidences over old rock salt mines and brine-pumping areas in Mid-Cheshire were illustrated, and the methods of rectification adopted in the author's Northwich area were outlined. A photograph of a typical subsidence in a Northwich street is reproduced herewith.

The last section of the address was headed, "Deficiencies of Distributors." While generation costs had been reduced substantially, distribution costs had remained stationary for the last ten years. This fact was important, because upon it was being built up a demand for the reorganisation of the distribution side of the industry. But Mr. Fennell's statistics showed that the experiment proposed, of reducing the number of distributing authorities and enlarging the size of their areas of supply, would not have the desired results. His figures showed that in the ten years during which distribution costs had been stationary the outputs of average undertakings had increased 2¼ times, while the average areas actually supplied must have increased by at least 100 per cent.

The cost of labour and essential materials, such as copper, lead and rubber, which affected the price of cables, had fallen substantially. The energy sales effort, though not yet as high as was needed, had been increased greatly. Nevertheless, the kWh per £ of capital had remained stationary during this period.

There must be a very powerful adverse influence somewhere. The first possible reason for unchanged, or increased, cost of distribution was the alteration that had taken place in the density of demand. As undertakings aged they extended into more thinly populated areas, or districts in which the population might be high, but not of a type capable of using so much electricity per head, or per mile, as the type in the "compulsory areas" first served.

It was therefore reasonable to assume that with a given system and voltage the cost of distribution, whether expressed as kWh sold per £ of capital invested, or per kWh sold, would rise as the density of demand fell. This adverse factor had proved to be more powerful than all the helpful factors, and in consequence there had been no reduction in the cost of distribution.

It was more than probable that the system judged in 1925 to be the best for distribution was no longer suitable, because a new zone of demand had been entered. The pre-1895 three-wire system was designed to extend the economic radius of distribution by doubling the transmission voltage. Again, about 1900 the actual consumers' voltage was doubled, further enlarging the radius. To-day consumers' voltage could not be raised above 230-V, so that in order to reduce distribution cost a return to the high-voltage distribution system, in a modified form, must be reconsidered.

Meetings and Discussions

Welded Ships
Special Points of the "Normandie"
Public Lighting Control

Shipbuilding by Welding

A PAPER on this subject by Messrs. N. M. HUNTER and H. W. TOWNSHEND (of Messrs. Swan, Hunter & Wigham Richardson, Ltd., and Smith's Dock Co., Ltd.) was read at the jubilee meeting of the NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS at Newcastle-upon-Tyne on November 15th. The authors deal with electric arc welding in ships of large and small size from a descriptive point of view of work done and not from a theoretical standpoint. Methods used in the fabrication of various parts of the hull structure are described and lists of the principal items of welding work in recently built ships are given. Instances are cited of both large and small ships in which experience has shown that welding work has proved more efficient than riveting for parts subject to severe strains and vibration. Procedure where work is partially welded is described and suggestions are given for improved structural arrangements which might be carried out by the aid of welding.

The authors state that arc welding is now recognised as an important aid to shipbuilding, and its field is being extended so rapidly that there are few shipbuilders or repairers in this country or abroad who do not now avail themselves of its use. Confidence in welding has grown to such an extent that the resources of shipbuilders are being taxed to fulfil the demands of shipowners and their superintendents for more and more welding in the important parts of the ship's structure; and so far as warship work is concerned the research carried out by the Admiralty has led to a reduction of weight without loss of strength in ships for the Royal Navy. Since the all-welded ship *Peter G. Campbell* was completed in 1933 a number of all-welded craft have been built in this country and abroad, a notable example of the largest of these being the oil tanker *Moira*, of 245 ft. b.p., built for ocean traffic. This ship was put into service in June this year and has been carrying light and heavy oils in the North Atlantic, where she encountered very heavy weather, but no sign of straining or leakage was observed when she docked recently for painting. Photographs and a cinematograph film of this vessel were exhibited at the meeting by the Quasi-Arc Co.

Yacht builders also are extending their use of arc welding, a notable example being the 83-ft. all-welded ocean-racing yacht *Wishbone*, built this year by Messrs. J. Samuel White, Ltd., of Cowes. She has been subjected to severe sailing trials and has completely confirmed the confidence of both builder and owner. The masts of most of the large racing yachts are now constructed of special steel welded for strength and lightness. In the merchant ship welding is rapidly displacing riveting in important parts of the internal structure, particularly in those parts which have in the past, on account of stress and/or vibration, given trouble with leakage through rivets and riveted connections.

Most of the welded construction work on the vessels referred to in this paper is built in as large units as possible in a special shop laid out for this purpose with a large floor of cast-iron blocks about 5 in. thick with numerous holes for dogging materials in position; such an arrangement permits of the work being assembled and welded under the most favourable conditions. From the paper it is evident that the extensive use of metallic arc welding in the construction of small craft is well established and becoming standard practice. Its further development is largely dependent upon the increase of the necessary facilities for its execution, and there will probably be some hesitation on the part of some shipbuilders in instituting such changes where they encroach upon the present arrangements for the preparation of materials for riveting.

The authors do not expect that shipowners in general will call for completely welded vessels until further experience has been gained with those at present in service. So far, experience of welded work is proving satisfactory, and a number of owners are looking upon it with increasing favour.

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Special Features of the "Normandie"

THE object of the paper which was read at a joint meeting in London on November 15th of the INSTITUTION OF MECHANICAL ENGINEERS and the SOCIÉTÉ DES INGÉNIEURS CIVILS DE FRANCE, was to review those features of the ship which the author, M. JEAN MARIE, described as innovations. The vessel is owned by the Compagnie Générale Transatlantique, of which the author is a director, and she was built by the Société des Chantier et Ateliers de Penhoët. She is 1,029 ft. long, 119.5 ft. in beam, and 91 ft. 10 in. in depth, and of more than 79,000 tons gross.

The extensive fire detecting and extinguishing system includes a central control room with which 100 control switches used by patrol roundsmen are connected direct by telephone. In the cabin corridors coloured indicating lamps are installed in place of alarm bells, which might cause false alarms by accidental ringing.

In addition, special precautions have been taken in the electrical installation. The electric lighting system is of low voltage (110 V) and the power and lighting wires are everywhere kept separate. Assuming that an outbreak of fire has been caused by an electrical disturbance, it should be possible to cut off the distribution of the current in the zone where the fire started; this zone, however, must be limited to the minimum. In other words, in the main section where an outbreak occurs, the ventilators and heating power are cut off, but lighting and lifts are kept going, except in the subdivisions where the outbreak started; in this sub-division the firemen work by the light of powerful portable electric lamps.

No special saving is to be expected in favour of electrical transmission as compared with gearing, at normal speeds, but electrical propulsion gives a lower consumption when steaming at half speed. Also, it makes less noise and is better for manœuvring. The choice of electrical propulsion was not arrived at, however, until after several big units equipped with geared transmission had been the target of some criticism. Synchronous motors were chosen as they can work at a power factor of 1, whereas asynchronous motors running at such slow angular speeds would necessitate a considerable increase in the dimensions of the alternators and entail a corresponding increase in the losses. In addition, asynchronous motors with wound rotors would have necessitated the use of complicated and cumbrous auxiliary fittings. The absence of any mechanical connection between the turbo-alternators and the propellers makes possible a better layout of the ship's interior.

This system allows of a reduction of the number of stages in the turbines, and permits of repairs being carried out on

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Rural Distribution Costs (*Continued from preceding page*)

Another possible adverse influence was waste of capital. By the institution of relief works thousands of miles of perfectly good d.c. three-wire mains had been pulled up and replaced by new four-wire a.c. three-phase mains. Mr. Fennell had found no sign of detailed inquiry by the authorities into the economic justification of this move, as compared with the provision of new feeders where distributors were overloaded. He suggested that the capital distribution accounts of most undertakings had been increased by 25 per cent. to comply with this urging by authority. While the standardisation of urban systems had been advanced thereby, Mr. Fennell contended that nobody but the manufacturer had benefited financially. On the contrary, over-capitalisation had resulted.

Overhead construction should have preference in all efforts to reduce expense. The cost of overhead work was, roughly, half that of underground work. The cost of h.v. overhead three-phase lines was about two-thirds that of l.v. four-wire lines of quite moderate capacity.

When schemes were submitted for approval, lines or loans, it was nobody's business to point out that they were too heavy, but only that they were too light. Only a few had pursued the straight and narrow way to success in rural work, namely, of looking before they leaped for what they could exclude instead of for extras they might include.

Distributors could not go on spending on the average ½d. per kWh for delivering their product to the consumer. The cure was not the scrapping of useful and efficient mains and gear, and the standardisation of what might well be the wrong system of distribution. It would be found in still further sales efforts and facilities offered to consumers; in the careful overhaul of distribution technique in order to increase existing carrying capacity; and in extending areas of supply on whatever system was able to produce the lowest cost per kWh sold.

Standardisation of voltage and system, while desirable, was not nearly so important as economy in further capital outlay, which was essential.

board. A double hull protects the rooms where the machinery is located; in the forward room are the four groups of turbo-alternators with their auxiliary machinery for condensing and lubricating, the control desks and operating panels, and the compartments for the h.p. fittings; in the second room are the four propulsion motors with their lubricating machinery, the convertors for exciting current and the thrust blocks.

The main power station is composed of four 33,400-kW turbo-alternators having a speed of 2,430 r.p.m., that is, ten times faster than that of the propeller motors. Each alternator is driven by two turbines in line on the same shaft, the high-pressure turbine carrying the control gear, and the low-pressure discharging directly in an underslung condenser.

This and the propulsion plant was dealt with in our issue of May 24th, the total output being 60,000 A at 220 V. In addition to protection devices controlling the admission of steam into the turbines in case of emergency, other devices have also been adopted in order to stop the excitation of the engines on one line of shafts in case of accident to one of the high-pressure circuits. In the event of an earthed insulation defect the neutral point of the motors is connected to the hull through a very high resistance which limits the fault current to a few amperes. When such a current is produced a relay actuates an audible signal, drives a current-reducing device, and feeds a time relay which, at the end of 30 seconds, dis-excites both alternator and motor. This arrangement permits the completion of a manœuvre, even if a short-circuit to the body of the machine appears at that moment.

For protection against short-circuits between phases of parallel circuits, use is made of the unbalancing of voltage which would then occur. A small asynchronous motor, driven by the turbo-alternator shaft, is set up in parallel to the circuits to be protected, and in case of accident, operates relays which instantly shut off the excitation. Finally, as a supplementary protective measure, safety devices have been installed against fire in the alternators, the motors, and the high-pressure cells; they provide for the instantaneous injection of carbonic anhydride into the spaces to be protected. The operation of the electrical propulsion is entirely automatic, and, to ensure safety, is duplicated in each of its phases by a hand-operated mechanical drive. The propulsion fittings include, for each group, one h.p. current reverser, a double group and sectioning switch, a controller for the excitation circuits, and a manœuvre desk carrying two levers, one for reversing the motors and the other for controlling the speed of the ship.

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Standardisation of Impulse-voltage Testing

IN the paper by MESSRS. T. E. ALLIBONE and F. R. PERRY, of the high-voltage laboratory of the Metropolitan-Vickers Electrical Co., Ltd., which was read at the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 21st a brief *résumé* is first given of the available information dealing with the wave-shapes of surges on transmission lines. The authors next define the wave-shapes of impulse voltages generated in the laboratory and recommendations are made for the standardisation of wave-shapes in order to facilitate the comparison of results obtained in different laboratories. Standardisation of impulse-testing technique is also advocated. Sparkover and puncture tests are considered in detail, and the extent of agreement of results obtained in different laboratories is indicated.

Standard impulse-voltage routine and type tests are recommended for line insulators, bushings, switchgear, and transformers, and reasons are advanced for the choice of such tests. The repercussion of the introduction into national specifications of impulse-voltage testing on the existing standardised power-frequency tests is considered in detail, and recommendations are made for the elimination of some of those tests.

In order to establish co-ordination between line and station apparatus under impulse voltages, a table is given showing the suggested impulse test voltages for station apparatus connected to normally insulated transmission lines, the proposed test values being based on the British Standard Specification for line insulators now widely in use.

Impulse-voltage testing is a comparatively new development, and the recommendations for standardisation of nomenclature and testing technique which are made by the authors of this paper should serve as a basis for routine and type tests until more information is available regarding the nature of transients on transmission lines. The testing of insulators is comparatively simple and should, the authors consider, be introduced without delay; the testing of switchgear and transformers depends on the line insulation, and it is suggested that two grades of insulation should be adopted depending on whether the line is a normally insulated or an over-insulated line. The tests for these assembled units are advanced tentatively as type tests, and if the tests are made up to the voltages quoted in the paper an ample margin will then exist between the line insulation and that of the terminal apparatus.

From the authors' experience the effect of the introduction of the tests will be to throw out a number of poor designs of electrical apparatus, but the test voltages, based as they are upon a specification for line insulators now widely in use, are not likely to prove to be so high as to make the recommendations economically unsound.

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The Purification of Water by Ozone

ONE of the papers read at the Public Works Congress was that by LT.-COL. G. E. MORGAN'S, of the British "Otto" Ozone Water, Wood and Textiles Treatment Co., Ltd., in which the author first describes the peculiar properties of ozone and its surprising chemical activity as an oxidising agent. He then explains how it is prepared by subjecting air to a silent electrical discharge between metal electrodes. Next, with the aid of diagrams and illustrations of plant, industrial ozone producers are described, performance and cost data being included. He says that in practice conditions differ appreciably, the efficacy of the method depending on several variables. It appears that in the production of one gramme of pure ozone approximately 20 kW of electrical energy is absorbed. Thus at 0.5d. per kWh one gramme of pure ozone will cost about 0.01d. About 5 grammes of ozone is required to purify 1,000 gallons of filtered water, so that 5s. will pay for the electricity needed to purify one million gallons.

Owing to the simplicity of operating ozone water-treatment plant, the supervision and labour costs are low, semi-skilled attendance only being necessary. Maintenance and repair costs are also small, since most of the plant is static, apart from the motor-driven air blower and high-voltage motor-alternator sets.

The latter portion of this long paper is devoted to detailed descriptions of ozone plant for water purification for domestic and small industrial uses; purification of rural water supplies; large installations for the supply of potable water to towns and cities; and swimming bath installations. Illustrations and brief details are included of plants installed for the purification of drinking water in France, Belgium, Italy, and other countries; some have been working 30 years.

The production of ozone involves a considerable capital outlay, but the amounts are normal and represent a small part of the total outlay on a water supply undertaking. The process is not too costly to run, and for a sum equivalent to that which has been expended on smoke abatement plant at a single electricity generating station in London ozone treatment plants capable of purifying the whole of London's water supply could probably be installed.

At a not very distant date the inhabitants of the British Isles will be using an average of at least 50 gallons of water per head per day, totalling some 2,000 million gallons per day. Also there will probably be, say, 2,000 swimming baths working for ten hours per day with an average throughput of 25,000 gallons per hour, making a total of 500 million gallons per day to be purified.

If the whole of this water were to receive ozone treatment the electrical energy absorbed might amount to 500,000 kWh per day, a welcome additional load for the grid.

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The Administration of Public Lighting

"PUBLIC Lighting, its Necessity and Administration," is the subject of a paper by MR. E. C. LENNOX, vice-president of the Association of Public Lighting Engineers, which was read at the PUBLIC WORKS, ROADS AND TRANSPORT CONGRESS in London on November 19th. In the first half of the paper, with the aid of graphs and statistical tables, the author reviews the relationship between road accidents and illumination with the object of emphasising the greater risks introduced by inadequate visibility and so indicating the need for more efficient street lighting service.

The second half of the paper is intended to show that so long as public lighting is administered in the present way the possibility of its being made adequate is remote. Therefore the author quotes examples to justify the opinion that changes in the present parochial system of administration are very necessary.

His conclusions are that the proportion of accidents by night is unduly high and that they have risen progressively during recent years, due to the increased use of roads during dark hours.

The increase in accident rate at night is due to lack of visibility, and the pedestrian suffers more heavily than the driver. Good visibility, obviating use of headlights, could be achieved by the provision of efficient public lighting, which would also reduce crime at night materially.

The cost of efficient public lighting would probably be less than the saving it would effect by the reduction of accidents and crime. Since it benefits the community as a whole, its cost should not be borne locally. No hope of efficient schemes of uniform lighting can be entertained unless public lighting is handled by a central authority, as in the administration of roads, transport, education, &c.

No smaller unit than a county borough should be a lighting authority, while in rural and urban areas the county council should be the administrative authority. As in the construction and maintenance of all public properties, street lighting installations should be under the control of competent public lighting engineers, with a central authority, *e.g.*, the Ministry of Transport, to classify roads for lighting purposes and to set up standards of lighting for various classes of roads (bearing in mind traffic density) with a view to obtaining uniformity. Public lighting is necessary during 46 per cent. of the year and to the road user is more vital to-day than ever before.

It is very necessary that public lighting be brought into line with other public services as regards administration and financial distribution, an alteration which will undoubtedly result in a general improvement both in its quality and quantity and a consequent saving of life, limb and total annual expenditure.

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Time-controlled Grid Frequency

IN a lecture to the BRITISH HOROLOGICAL INSTITUTE in London on November 13th Mr. F. HOPE-JONES spoke of the Central Electricity Board's method of imposing Greenwich mean time upon the frequency of generating stations connected to the grid system. There were now 130 selected power stations, he said, with central control rooms in nine districts, each closely supervised with respect to time-keeping with the aid of the best types of clock obtainable and checked by the six second dots broadcast by the B.B.C. from Greenwich observatory.

Quite apart from, and in addition to, the official control, which in itself should be sufficient, practically all the individual generating stations had frequency time-checking outfits of their own. This duty had been thrust upon the C.E.B., which did not need to concern itself with keeping the average frequency close to G.M.T., but only to the time of its neighbours when sharing a load. The attempt to keep time accurately to the Greenwich standard was a task undertaken with the wider view that any fresh field of utility would assist in popularising electricity and be of ultimate benefit to the profession.

But, however good the time-keeping of the grid might be or become, Mr. Jones claimed that circuits of electrical impulse dials for large institutions were so much better as to be practically indispensable. There was, however, a prospect of happy alliance between the two methods which appeared to be antagonistic. One of the results of the good time-keeping of the grid had been to turn the attention of the proprietors of systems of electrical impulse dials to the use of synchronous motors as master clocks. There were already several of these in existence, each having its own distinctive method of substituting a.c. mains supply in case of breakdown. Some had an additional motor and some a tuning fork. Mr. Jones preferred to rely upon capacity and induction in a tuned circuit than upon a reed. The change would not be a sudden one, but with the improvement of the grid's time-keeping it was bound to become superior to the performance of any master clock left unattended.

There were certain merits and practical advantages in the "Synchronome remontoire" system which for electro-technical reasons made it almost indispensable for the perfect operation of circuits of electrical impulse dials. Could one retain those virtues while dispensing with the pendulum? One could do so by using a synchronous motor to rotate a disc under the "Synchronome" gravity lever at a speed of one revolution in two seconds. A pin on this cam, serving as a one-leaved pinion and taking the place of the gathering click, turned the familiar 15T count wheel tooth by tooth, completing a revolution in half a minute, and accomplishing the release of the gravity arm by a vane in the ordinary way. But, since there was no pendulum, there could be no impulse pallet. It was therefore necessary to provide other means to let the gravity arm fall gently into contact. The disc was therefore shaped in the form of a cam to enable it to perform this office.

In referring to the Warren frequency meter and the "Telechron" clock, Mr. Jones explained how Messrs. Everett, Edgecumbe & Co., as representing the Warren system, became the pioneers in this country in the time equipment of generating stations. About sixty stations had "Synchronome" frequency-checking clocks, either in their ordinary form or of the Smith-Synchronome type. There were also over 100 "Synchronome" master clocks incorporated in the grid metering equipment.

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Thermal-electric Stations

In the course of the discussion on the address on this subject by Mr. H. R. Ayton as president of the BELFAST ASSOCIATION OF ENGINEERS (ELEC. REV., November 15th, page 676), Mr. F. H. Whysall, city electrical engineer, Belfast, said that almost twenty-five ago a scheme more limited in its application than that outlined had been put into operation by him in Manchester, so that he was not unmindful of its possibilities where the conditions would permit of its economic application. In his opinion the time was not yet ripe for embarking on such a scheme for Belfast, as the low tariff which the Corporation offered to power consumers would enable the consumers to use the public electricity supply for power purposes and their own plant for steam-raising purposes at an economic figure; there had been no demand from the public for a joint electricity-steam service. There was a very wide difference between commercial efficiency and thermal efficiency, and every case must be considered on its own merits. So far as the utilisation of exhaust steam for heating purposes was concerned the climate of Belfast did not offer the same inducements as those parts of America and Canada mentioned by the author. The public was buying not only thermal units but also satisfactory service, and owing to the efficiency of applications possible with electric heating, and the low tariffs available, the complete electrification of large buildings was making very rapid progress.

* * *

Electricity in the Home

At the informal meeting of the INSTITUTION OF ELECTRICAL ENGINEERS in London on November 11th MR. W. E. WARRILOW opened a discussion on "The Electric House from the Electrical Point of View," basing his remarks on experience acquired in the residence near Watford which was built and equipped to his design about seven years ago. A number of lantern slides showed the excellent arrangements and appointments of the house's all-electric services. One notable exception was the retention of a coal fire in the lounge, and the excuses made for this were not readily accepted. Mr. Warrilow thought electrical installations were at a great disadvantage upon the score of complexity and cost, and he pleaded for more haste in the standardisation of parts and in the elimination of the variety of sizes and capacities. A very large meeting included several members of the Electrical Association for Women, and other ladies, and many of those present were prevented by time from expressing their views. The masculine contributions to the discussion were mainly criticisms of cost and questions of policy, leaving the ladies to express enthusiasm and zeal for the all-electric house. So much was this apparent that Mr. Warrilow, in his concluding remarks, thanked the ladies for their co-operation and said he felt that an Electrical Association for *Men* was badly needed.

* * *

Motor Construction

In a paper entitled "Recent Progress in Induction Motor Construction," delivered before the Scottish Centre of the INSTITUTION OF ELECTRICAL ENGINEERS in Glasgow on November 12th, Mr. L. H. A. CARR described the principal developments which had taken place during the past few years. He fully described a number of welded-steel yokes or stator frames made by different manufacturers, and discussed the advantages and disadvantages of this type of frame, as well as those of the welded-steel rotor centre or spider. The general trend of mechanical construction was outlined, together with considerations affecting enclosure and ventilation, while the construction of end-shields, pedestal-on-bracket machines, and bed-plates was discussed.

* * *

Photoelectric Control

A paper by Mr. E. W. FORSTER, which was read before the London Local Group of the ELECTRICAL POWER ENGINEERS' ASSOCIATION on November 18th, compares photoelectric cells with other light-sensitive devices, describing photoelectric relays and their several applications, including precision limit switching and factors affecting the choice of equipment.

Correspondence

Contributions from readers are welcomed. The writer should give his name and address, not necessarily for publication

Cheap Electricity?

I should like to endorse the remarks contained in the letter from "Grid" which appears in your current issue. The undertaking with which I am concerned is having considerable difficulty with the Central Selling Board in this district regarding coal supplies. Our contracts expired on September 30th last, since when the prices have been advanced. We do not object to meeting this extra cost provided it is due to an increase in the miners' wages and, as "Grid" states in his letter, this could be provided for by the insertion of a wages clause in the contract.

The Central Selling Board has, however, dictated to us regarding the maximum quantity of each slack which shall be delivered to the station and "laid down the law" as to whether the coal shall be delivered *via* road or rail transport. The latter is a factor intimately connected with the handling charges at the station, and despite our claim that the method of transport cannot affect the wages of the miners we have been obliged to accept the Board's ruling.

Again, we have in the past purchased coal supplies on an "as received" basis with a bonus/penalty clause for high/low calorific values. The Board refuses to accept such a clause and consequently we are left without any proper safeguard against deliveries of inferior quality.

The question of coal costs in this country is of the greatest importance to the success of the grid scheme, and I hope, therefore, it will be possible for the Central Electricity Board to take such steps as will rectify the present state of affairs. Failing this it might be arranged that the company and/or municipal undertakings take some form of concerted action in the matter. R. A. G.

November 18th.

Dangerous Street Market Lighting

It seems surprising that the dangerous and dilatory methods used in fitting the majority of stalls in market streets with electric light are permitted. These crude installations vary —some have several metallic holders hung about the stall, with numerous joints in the flexible cords, others have metal holders fixed on a wooden batten, while some have lengths of conduit with several holders attached and fed from an adjacent shop by a two-core flex and adaptor or two-pin plug.

Surely something should be done to alter this state of things. Apart from the fact that it shows a disregard of I.E.E. Regulations, there is the danger of a severe shock should a leak develop, especially when one considers that the installation is very often within reach, not only of the stallholder, but the general public, as the holders for the lamps are often hung about the goods displayed. As practically every supply company now employs a pressure of 230 V a.c., a shock at this voltage could easily prove fatal, especially if the ground were wet. P. A. RAYNER.

Edgware, *November 17th.*

The Walsall-Cannock Extension

I notice on page 688 of your November 15th issue a reference to the Walsall Corporation extending its mains into the Cannock district. As this gives the impression that the mains are being extended into the supply area of this undertaking, I should be glad if you would make the necessary correction in your next issue.

The extension in question is to afford a supply to specific premises in the Cannock Rural District, situated in the supply area of the West Midland Joint Electricity Authority, and not in the Cannock Urban District as one might gather from your report. P. WARDLE,

Cannock, *Nov. 18th.* *Chief Engineer and General Manager.*

Development Staffs' Salaries

The letter from Mr. E. Thompson published in your issue of November 8th provides me with an excuse for raising again the subject of the low standards of remuneration fixed by supply authorities generally for their showroom and development assistants.

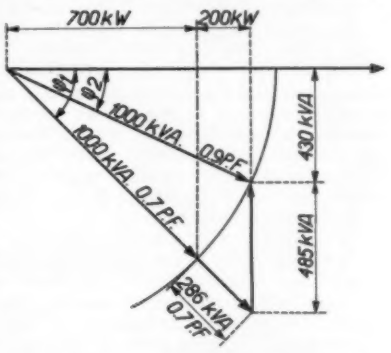
Mr. Thompson's unfortunate experience seems to indicate, apart from unreasonable conditions of supply, the employment of unintelligent and inefficient staff for that important department of unit-selling, the establishment and maintenance of good business relations between the public and the authority. I conclude that this was but a further instance where the qualifications of the assistants were on a level with their salaries. In the supply company with which I am connected the showrooms and offices are staffed with assistants engaged at from 25s. to 45s. weekly, and complaints by letter and by telephone similar to that made by your correspondent are constantly received. Yet suggestions that a higher scale of remuneration be offered to attract a better type of man are ignored.

Judging by occasional letters to your journal and by the particulars given of situations vacant, the placing of a low value on showroom and development work is fairly general. As you remarked in your editorial of November 1st there is a tendency on the part of the industry to congratulate itself on the stage of development at which it has arrived—not wholly by its own efforts. One wonders how much sooner we would reach that "goal of an electrical civilisation" for which we are striving if our boards and electricity committees revised their present ideas of what constitutes suitable personnel, not only for the issuing of application forms and receipts, but for the direct encouragement of "electrical-mindedness." SERVICE.

November 14th.

Power Factor Improvement

In the article on this subject by Mr. T. H. Carr in your issue of November 18th, the capacity of a phase-advancing plant is calculated to increase the true power output of a 1,000-kVA generating plant from 700 kW to 900 kW. This is shown by:— $\rho\,(\sin\phi_1 - \sin\phi_2) = 1{,}000\,(0.71 - 0.43) = 270$ kVA where ρ represents the permissible apparent power of the generating plant.



This should be, however:—$(1{,}000+200/0.7)\ 0.71-1{,}000\times0.43=485$ kVA, because the additional load of 200/0.7 kVA also has an idle-power component. Or, more simply: $\rho t\ (\tan\phi_1-\tan\phi_2)=900\ (1.02-0.48)=485$ kVA, where $\rho t=900$ kW, the desired true power after installation of the phase-advancing plant. This can readily be seen from the accompanying diagram.

Mr. Carr's calculation would only be correct if the additional load of 200 kW consisted of lamps or other apparatus with unity power factor, which themselves improve the power factor. Mr. Carr assumes, however, that the additional load has the original power factor of 0.7. When static condensers are used for p.f. correction the price of the calculated 485 kVA is much less than the price for the additional generating plant. The efficiency of the static condenser being 99.75 per cent., it shows a great saving over that of the generating plant. Condensers connected at source of low power factor save increase in cable section, reduce losses in the mains, and decrease volt-drop. G. R. TODMAN,

Philips Industrial (*Philips Lamps, Ltd.*)

London, W.C.2, *November 15th.*

Motor-car Voltages

With regard to Mr. E. F. Ford's arguments for the 6-V lighting equipment on motor vehicles, in your correspondence columns of November 15th, for the most part American cars are fitted with 6-V sets, and after some little time on the road they suffer more from electrical trouble, than do British cars.

Shortly after the war some British and Continental manufacturers were influenced by American practice. The results were much profit to the garages and annoyance to the owners. Admittedly, the "attention" given by the owners and by the average mechanic of the time was of the worst, but the superiority of the 12-V set was very evident. After some years, during which most of the better makes of British cars used 12-V sets, a few reversions to 6-V appeared, in the hope, no doubt, that the original troubles had been overcome by our electrical colleagues. This was not so, however, and starters refused to give the requisite lively spin to the engine on a cold morning; head-lamp beams thus became diffused, accumulators suffered from extremes of over- and under-charging, and contact-breaker points were more often in need of cleaning and trimming. One popular British light car was an exception, and so, too, was the lay-out of its electrical system, with very short distances between the various components.

At the present time, the 12-V system has been adopted by the majority, and by the very firms to whom any cut in the production costs would make a strong appeal if performance would not suffer. As I have charge of the servicing of several makes of both British and American cars, I have noted the difference in the behaviour of the two systems, and as an automobile engineer and not an electrical engineer. I have come to the conclusion that at some point below 12-V we reach a condition where every speck of dust is a potential circuit-breaker, and that any lead above a certain length, with standard wiring cable, gives a drop in pressure, which becomes serious at about 6-V.

In one case, where the manufacturer of a popular light car has fluctuated between the 6-V and the 12-V systems, 400 cars with 6-V and 750 with 12-V equipments were serviced within the first two years of their existence. With the 6-V cars the total times of attention for electrical troubles was 2,700; with the 12-V the figure was 957, notwithstanding the additional load imposed in the latter case by starter, double-blade screen wipers, traffic indicators, &c. The 6-V defects were, in the main, dirty contacts in the lamp sockets and bad contact between the lamps and the wings and between the wings and the chassis, sticking dynamo and starter brushes, frequent cleaning of contact breaker points in the distributor, and battery collapse.

In most instances where it was possible to make a test on the same circuit by using a good large-scale voltmeter and changing over to 12 V, a greater relative drop in the voltage was noticed with the 6 V. In one case of poor headlights, the reading at the lamp socket when the battery showed 6.5 V, with one 24-W lamp in circuit, was 4.5 V, whilst with a 12-V battery, showing 13 V, and a 24-W lamp in the circuit. the reading was 11.5 V. I can well imagine that with the greater amperage required at the starter terminal, any similar loss would be amplified. In another case a film of oil between the contact breaker points prevented the engine from starting with a 6-V set, but by simply applying 12 V at the feed terminal, the engine started on its own voltage (6 V), and this condition could be reproduced.

My crude tests may not prove anything, but I can say from years of experience in the motor trade that, good as the lower voltage may appear on paper, it fails in practice. Mr. Ford has raised a very interesting question, which I hope will promote an instructive discussion.

Wakefield, *November 17th.* C. K. HEMSWORTH, A.M.I.A.E.

All-electric Houses

Mr. Spencer's letter in your issue of November 8th was interesting and practical, but I would like him to furnish a few further particulars.

How many persons are there in the family? What are the approximate areas of the four principal rooms, and what sizes of radiators are found to give adequate heating, even in cold weather? Is the 2-kW immersion heater fitted in the usual 30-gal. storage tank found in the average small house, and if so, how is the tank lagged, and what is the thermostat setting? What is the approximate number of baths supplied weekly, and is any laundry work done in the house?

I believe it is a common complaint that the drawing of a bath from a storage tank fitted with a 2-kW heater results in a great scarcity of hot water for several hours.

Anerley, S.E.9, *November 12th.* C. P. TUFNELL.

With reference to the letter by Mr. A. Wilkes appearing in the correspondence columns of your issue of November 15th I have to inform you that the domestic charges mentioned in his letter are not applicable to the supply given by the Chesterfield Corporation. The fixed charge under our domestic rate would be lower, as also would be the running charge, *i.e.*, ½d. per kWh. D. H. DAVIES,

Chesterfield, *November 18th. Borough Electrical Engineer.*

The Value of Qualifications

Of the various suggestions put forward by "Aspirant" in your issue of November 8th, the one which, in my opinion, should prove of greatest value to him in his career is the B.Sc. degree in Economics. One gathers from a careful reading of his letter that he is not anxious to obtain knowledge for knowledge's sake, and therefore the B.Sc. in General Science can be ruled out. For the same reason the A.M.Inst.C.E. is hardly likely to be of much value, although it is impossible to tell if any particular item of knowledge may or may not at some time or other be of practical use, and some of the work of the mains engineer is closely related to that of the civil engineer.

Unless an engineer is right at the summit of his profession, when he may be qualified for one of the "plums" which are occasionally offered, he will find that at the age of thirty-one years he ought to be firmly established with his employers, and he should, moreover, be in a position to visualise in what direction he hopes to obtain preferment. As mains engineer in a large undertaking with the aspiration to become chief engineer at some future date, commercial knowledge such as would be obtained in studying for the B.Sc. in Economics should prove of particular value.

The examination for the associate grade of the Institute of Industrial Administration may involve the acquiring of just the same amount of commercial knowledge, but it does not carry quite the same weight as a university degree. It is generally admitted that a university degree implies a measure of general culture such as is not necessarily associated with the membership of any of our leading technical institutions, and "Aspirant" will find that most employers will consider "B.Sc.(Eng.), A.M.I.E.E." or "B.Sc.(Econ.), A.M.I.E.E.," a far greater recommendation than "A.M.I.E.E." alone. If the employer possesses any business intuition and the position on offer involves a measure of commercial knowledge, the "B.Sc. (Econ.), A.M.I.E.E.," should have the desired effect.

London, S.W.11, *November 17th.* A. REGNAULD.

The only value of paper qualifications to the engineer is that they show that he has received a recognised training which should have qualified him for a technical post in some engineering firm. The B.Sc. by itself is not of much use as it is no proof of practical experience which is so necessary in engineering work, and again membership of any of the three chief engineering institutions does not indicate much more than that the member is qualified in one single branch of engineering.

In my opinion the ideal combination is B.Sc., A.M.Inst.C.E., A.M.I.E.E., for an electrical engineer, since this shows that a thorough technical training has been received, backed by practical experience of such a nature that it has been accepted by the Councils of both Institutions, and it must be remembered that their requirements are very different. The second best combination is A.M.Inst.C.E., A.M.I.E.E., and third best B.Sc., A.M.I.E.E.

These above remarks only apply to men employed on heavy engineering, as obviously the third combination is by far the best for scientific workers employed in light engineering such as meters, wireless, telephones, &c., since the first and second indicate that the engineer has spent some considerable time on the practical side of heavy engineering which may be a disadvantage rather than an advantage for scientific workers on electrical research, who as a rule start this class of work straight from the university.

I have proved the value of the A.M.Inst.C.E. by the fact that as soon as I was elected by the "Civils" I started to get my name on the short lists for appointments, whilst when I was only an A.M.I.E.E. all my applications were in vain.

In these days the value of economic training is being more and more recognised and I feel that "Aspirant" would be well advised to get his B.Sc. (Economics) and his A.M.Inst.C.E., for the combination of these qualifications, coupled with the A.M.I.E.E. would be very strong.

November 18th. A.M.INST.C.E.

Fuses for Distribution Networks

In reply to Mr. Norris's letter in your issue of November 8th the test to which he refers is one of a series carried out by a supply company, the object being to compare the performance under short-circuit conditions of an English Electric high-rupturing capacity fuse with that of a high-grade circuit-breaker which, for the purpose of test, was not fitted with time lags. The size of fuse specified was 500 A, capable of carrying 800 A for more than thirty minutes, the time-current characteristics not varying by more than plus or minus 5 per cent.

The supply company desired information concerning the performance of the fuse and circuit-breaker when tested in series and independently, particular attention being paid to the voltage surge when the circuit was opened. The results showed that when tested in series the fuse opened the circuit before the circuit-breaker had operated, and when tested independently the voltage surge of the fuse was of a negligible order, whereas the circuit-breaker produced a serious voltage surge. The rate of current change during the arcing period of the muse was 1,050 A per milli-second, whereas with the circuit-breaker it was 2,670 A per milli-second.

The temperature rise of an English Electric high-rupturing capacity fuse under full-load conditions does not exceed 60 deg. C., and the largest size available is 800 A, which was also tested on the same circuit and showed its ability to open the circuit silently and without external flame.

For THE ENGLISH ELECTRIC CO., LTD.,
R. M. Pooley, *Manager Fuse Gear Section.*

Stafford, *November 18th.*

New Apparatus and Devices

for Domestic, Cooking and Heating, Lighting, Power and Scientific Purposes

An Exhaust Fan for Home Use

Ventilation by the extraction of impure and used air is accomplished by a small fan—the "Silent Axia 6"—made by WINSOR ELECTRIC FANS, LTD., 9, Victoria Street, London, S.W.1. The fan and motor are housed in an attractive bakelite casing designed to prevent rain, wind or dirt from entering the room when the fan is not in use.

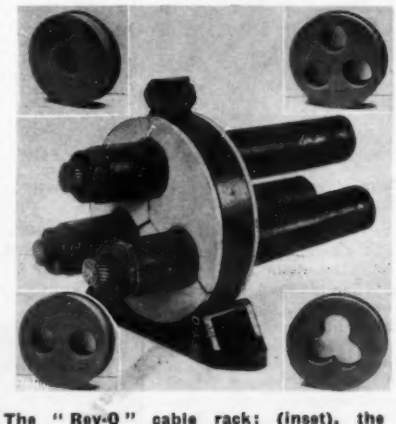
The "Silent Axia 6" exhaust fan

The rotor, which is balanced both statically and dynamically, has six 6-in. blades, and is claimed to move approximately 200 cu. ft. of air per minute. The motor is obtainable suitable for all voltages, a.c. or d.c., and is totally enclosed, requiring only a spot of oil every three months. Its loading is 10 W.

The fan is easily installed by cutting a 6¾ in. diameter hole in one of the upper panes of a window. It can then be fixed firmly without the use of nuts and bolts, by screwing the outer half of the casing into the other half. The fan is silent in operation.

An Improved Cable Rack

A cable rack for supporting one, two or three cables is being marketed by MESSRS. A. REYROLLE & CO., LTD., Hebburn-on-Tyne. Normally three cables, each of a different phase, are grouped together in one rack. The base-plate of the rack, which is of silicon-aluminium, has two galvanised mild-steel straps hinged to it, and these are drawn together by a nut and a bolt and tightened down on a hardwood insert, which they clamp firmly in position. Alternative types of inserts are available. The inserts are bored out to bed to the cable sheaths, and are afterwards coated with fire-resisting paint. They are clamped round the cables and supported centrally in the racks by the straps. Since the clamping-straps form parts of a circle, and are strongly hinged, the racks can withstand the forces set up by short-circuit currents. The wooden inserts act as buffers to lessen the impact forces, and as they can be set at any angle they facilitate the transposition of the phases in cables running alongside masses of steelwork.



The "Rey-O" cable rack: (inset), the various types of rack available

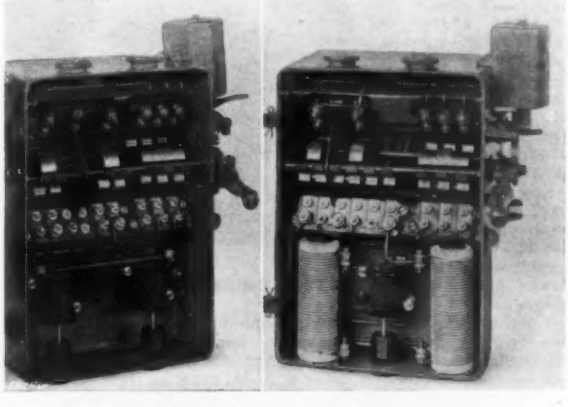
The racks are suitable for cables of diameters up to 2½ in., and only the size of the holes in the wooden inserts need be altered upon occasions when cables of different diameters are used.

Brook Motor Starters

Three new starters are included in the latest list issued by BROOK MOTORS, LTD., Huddersfield. One of these, type ESA, is an air break combined stator and rotor starter for slip-ring motors, somewhat similar in construction to the three-phase drum type which has been on the market for some time. The no-volt and two overload trips are fitted with oil-immersed time lags and two types are available with maximum stator ratings of 25 and 60 A.

Another new-comer is the type "A1" faceplate stator starter of the graduated resistance pattern for squirrel-cage motors, each starter being designed and tested for the motor it has to control. Overload trips, where fitted, are of the coil type and adjustment is possible, but single-phase motors are not designed to give overload. The starters are not offered for voltages above 480, and when the supply is below 400 and above 240 V the next larger size should be used. They are made for standard squirrel-cage type motors up to 30 h.p. and similar high torque machines up to 20 h.p.

Air break combined stator and rotor starters are also available. This type of starter is of the drum pattern and is offered

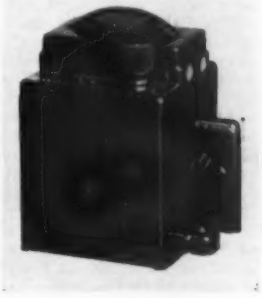


Types ESA and SSA Brook motor starters

as an economical alternative to the faceplate type. The design and construction follows, where possible, the standard combined stator and rotor three-phase type, operation being by a ratchet handle at the side of the starter, while a special mechanism ensures correct operation. The starter, type SSA, cannot accidentally be left in the partly "on" position, and is obtainable rated at 5 h.p. 200/240 V (7½ h.p., 400/480 V) or 10 h.p. 200/240 V (15 h.p. 400/480 V).

Suppressing Radio Interference

A compact radio interference suppressor offered by the TELEGRAPH CONDENSER CO., LTD., Wales Farm Road, North Acton, London, W.3, comprises two non-inductive condensers with 2-A fuses in series. It is tested up to 2,250 V d.c. and is suitable for working up to 1,000 V d.c. or 300 V a.c. The unit can be connected in various ways to suppress either radiated or direct interference, or modulation hum; it is housed in a bakelite case and the withdrawal of the fuse-carrier automatically breaks the circuit.



The T.C.C. interference suppressor

A Commercial Lighting Unit

THE EUSTON MANUFACTURING CO., LTD., 143b, Euston Road, London, N.W.1, has produced a new lighting unit in four sizes, 10 in., 12 in., 14 in. and 16 in. diameter for lamps up to 300 W. At least six different combinations of glassware are obtainable and the method of fixing the glass together is very simple.

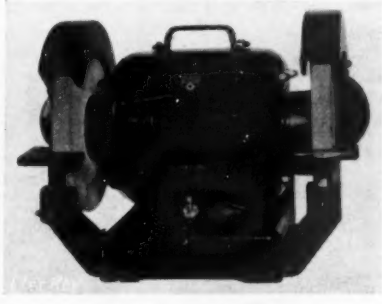
The new "Euston" lighting unit

The fitting was primarily produced for use in tea rooms, offices, banks, showrooms, &c., where a good general illumination is necessary and a high degree of glare-free illumination is essential on the horizontal plane. It comprises a specially shaped upper globe with a hemispherical lower globe of half the diameter. The lower globe has a small flange and rests in a suitable hole cut out of a disc of silk matted glass, these two glasses being securely attached to the upper globe by

means of a simple clip device. The heavy-gauge spun copper gallery is well ventilated by means of a continual current of air between the glasses. The use of gallery screws is obviated by the provision of a special spring clip which holds the upper globe securely in position.

Batwin Electrical Developments

A capacitor-start induction-run motor specially constructed for refrigerators, is one of a number of new products marketed by BATWIN ELECTRICAL APPLIANCES, LTD., 138, Southwark Street, S.E.1. It is made in ¼- and ½-h.p. sizes and special features are:—Three-point suspension on rubber, wool-packed bearings of extra length for lubrication purposes, readily-detachable base, adjustment at shaft end to take up end play, automatic belt-tightening, silent running, and high torque.



The "Batwin" grinder unit

Another item is the "Cetron" photo-electric cell of American origin which has an average ionisation voltage of 125, although the normal value recommended is 90 V, while a special cathode-treating process is claimed to increase sensitivity. It is said to have an almost straight line frequency response from 20 to 100,000 cycles, with a response drop of less than two db. in output over the audible range. Thirty-six types are made, apart from special varieties. They are stated to withstand high temperatures, and the glass bulbs are selected for clarity to minimise light absorption. The average sensitivity of vacuum cells is given as 30 mA per lumen, and that of gasfilled cells as 150 mA, or 100 mA, for type CE.5, which ionises at 175 V.

The "Tru-vac" vacuum gauge, originally developed for use in the manufacture of the above-mentioned photo-electric cells, is now available for general use. It is electrical in operation, without moving parts, the gauge being connected by wires to the instrument box; a recorder can be added. The speed of the pumps is indicated as well as the degree of evacuation, and the gauge does not discriminate between gases; it indicates the presence of moisture and other vapours as well as dry pressure. The instrument has a dual range of from 0 to 600, and from 600 to 10,000 microns.

Leyland inductors for controlling sign displays and mobile colour lighting are also of American origin. They are motor-like in appearance and are rotated by levers or a small actuating motor, delivering a continuously variable output voltage greater or less than the fixed input. When the lamps controlled are at full brilliance the line voltage passes through the inductor windings without transformation. These machines are available in capacities up to 4 kW for single circuit use, and up to 9 kW for multi-circuits, or they can be arranged in tandem with single drive.

In addition there is a new self-contained grinder unit which includes both fine and coarse 6-in. grinding wheels. The motor is rated at ¼ h.p. A larger size is made with 8-in. wheels and a ½-h.p. motor.

A.c. Commutator Motor with External Regulation

To extend its range of variable-speed motors the BRITISH THOMSON-HOUSTON CO., LTD., Rugby, has recently developed a variable-speed commutator machine of a different type. It is a polyphase shunt commutator motor, type CFT, and operates in conjunction with a separate induction regulator.

The motor itself is simpler than type CHT, as the supply is connected to the stator instead of to slip-rings, and the regulation is carried out away from the machine without any additional gear, which is often a valuable feature for small machines. The design lends itself to totally enclosed operation without an excessive reduction in output. The primary winding on the motor stator is connected to the three-phase supply, while the commutator winding, which constitutes the secondary of the motor, is connected to the secondary terminals of the regulator.

The B.T.H. type CFT 3-h.p. a.c. variable-speed commutator motor with regulator

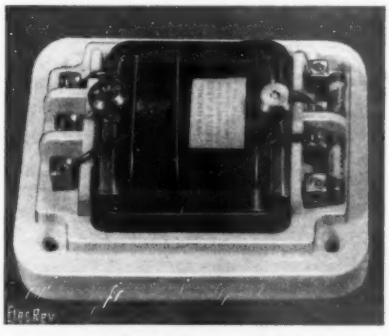
Because a commutator is used the voltage at the secondary terminals, instead of having the variable slip frequency as in the case of a slip-ring induction motor, has the same frequency as the supply voltage whatever the speed of the motor. The speed of the motor can, therefore, be varied above and below synchronous speed by applying a variable voltage of supply frequency to the secondary terminals. This is obtained from an induction regulator, which acts as a variable ratio transformer with the primary connected to the supply and the secondary connected to the secondary of the motor.

The regulator is a double unit, consisting of two induction regulators with secondary windings in series. The two primary windings are in parallel with the supply. The resultant regulating voltage taken from the secondary terminals has a constant phase and variable magnitude. At the same time the torques of the two halves neutralise each other and there is no resulting torque on the regulator shaft. Thus a worm gear for holding the rotor is not necessary.

For starting only a simple three-phase supply switch is required. With the regulator in the low speed position, the motor will exert a starting torque of approximately 1¾ times full load torque with approximately 1½ times full load current, after which the speed may be raised. If the switch is closed when the regulator is not in the low speed position, both the starting torque and the starting current will be increased, while the running speed will be higher.

A Fused Bell Transformer

A fused bell transformer known as the "Golden Arrow" has been introduced by MR. J. TOUBKIN, Faraday House, Todd Street, Manchester, 3. It is robustly constructed on a white porcelain base, 1-A fuses being incorporated in each pole of the primary circuit. The cover, which can be removed by undoing two plated milled nuts, is of brown bakelite. Secondary voltages of 3, 5 and 8 are obtainable from a 200/250-V supply.



The "Golden Arrow" bell transformer

Electric Garage Tools

Work which can be done by the portable electric sanding machine, introduced by MESSRS. S. WOLF & CO., LTD., Pioneer Works, Hangar Lane, Ealing, W.5, includes grinding down rough spots, sanding surfaces and removing rust before refinishing, grinding castings of irregular shapes, removing flash from welded joints, polishing flat surfaces of sheet metal and surfacing materials such as stone and concrete. A 7 in. sanding disc can be easily removed when the machine is required for use as a cup grinding wheel or wire brush. The spindle is driven by a small universal motor having a speed, when running light, of 4,500 r.p.m. and a loading of 230 W.

The Wolf sanding machine

The company also makes the "Duo Synchro" tool which has both a high and low speed spindle; the high speed is suitable for grinding in the valve seats of automobile engines or, with the aid of accessories available, for polishing them, while the low speed drills holes up to ¼ in. in diameter and is suitable for decarbonising, valve guide cleaning and rust removing.

Ball bearings are used throughout and a universal motor is employed giving a speed of 14,000 r.p.m. to the high speed spindle and 2,500 r.p.m. to the low speed spindle when running light. The loading (light) is 100 W and the weight 8¼ lb.

British Overseas Electrical Trade

Another big improvement

ALTHOUGH October, 1934, was a particularly good month as regards our electrical exports, the figures for last month were substantially better still. As will be seen from the table on the right, compiled from statistics published in the Board of Trade returns, the total value of such shipments was £1,329,609, representing an increase of £169,707, or 14.6 per cent. Both months contained twenty-seven working days (*i.e.*, excluding Sundays). Compared with September, which had two fewer working days, there was an increase of £125,577, or 10.4 per cent.

Imports also reached a high level, the total of £427,790 being £80,690 (23.2 per cent.) above that for the corresponding month of last year and £112,255 (35.6 per cent.) more than in September. Thus, proportionately, the growth in imports exceeded that of exports. It is, however, encouraging to recall that when the value of our exports was last in excess of £1,300,000, namely, in December, 1930, imports were well over £800,000.

Increased Telephone and Telegraph Shipment

British manufacturers of telegraph and telephone apparatus seem to be finding an ever-increasing market for their goods overseas, both within the Empire and in foreign countries. In October the total value of their shipments forged still further ahead, reaching £203,038—£97,625 more than in the corresponding month of last year. The following is an analysis of the chief destinations of such equipment, with the October, 1934, totals in parentheses:—Australia, £47,037 (£15,274); South Africa, £36,680 (£26,417); Argentina, £3,745 (£7,227); Canada, £894 (£1,419); other foreign countries, £88,077 (£34,499); other British countries, £26,605 (£20,577).

Shipments of cables of various descriptions amounted in value to roughly a quarter of a million pounds. From the following analysis of the chief destinations (excluding telegraph and telephone cables) it will be seen that the quantity of the rubber-insulated variety sent to British India was twice (£8,064); British countries, £9,586 (£10,644); other foreign countries, £49,516 (£26,798).

EXPORTS AND IMPORTS DURING OCTOBER

	Exports. Oct., 1935.	Exports. Inc. or dec. compared with Oct., 1934.	Imports. Oct., 1935.	Imports. Inc. or dec. compared with Oct., 1934.
Submarine telegraph and telephone cables	£11,283	+ £9,085	*	—
Telegraph and telephone wires and cables (not submarine)	31,472	— 18,324	*	—
Other insulated wires and cables	214,849	+ 31,696	£22,698	+ £388
Radio receivers (not radiograms), excluding valves	36,043	+ 4,700	31,983	+ 2,737
Radio transmitters (excluding valves)	9,484	— 10,222	*	—
Radio valves	57,160	+ 13,581	20,425	— 9,298
Other radio parts and accessories	64,113	— 4,511	90,778	+ 26,211
Telegraph and telephone apparatus (other than radio)	203,038	+ 97,625	*	—
Electric carbons	*	—	8,411	— 5,239
Incandescent lamps	52,475	— 4,242	18,767	+ 5,740
Other lighting apparatus	44,403	+ 2,280	63,697	+ 30,922
Primary batteries	18,596	— 3,865	681	— 231
Accumulators	46,400	— 7,951	*	—
House service meters	14,887	+ 2,307	*	—
Other electrical instruments	19,778	+ 6,603	28,902	+ 2,360
Unenumerated electrical goods and apparatus	138,240	— 30,733	84,458	+ 21,974
Electric generators up to 200 kW	30,334	+ 8,285	*	—
Electric generators over 200 kW	24,054	+ 5,985	*	—
Electric motors	92,589	+ 3,938	21,608†	+ 7,720
Convertors and transformers	68,222	+ 33,717	*	—
Starting and controlling gear for motors	37,074	+ 9,888	*	—
Switchgear	96,729	+ 11,961	*	—
Other electrical machinery	18,386	+ 7,904	7,151	— 15,464
Electric vacuum cleaners	*	—	28,231	+ 12,870
Total	£1,329,609	+ £169,707	£427,790	+ £80,690

* Not classified separately. † Not railway and tramway motors.

Electric vacuum cleaners.—Canada, £13,371 (£6,828); Sweden, £6,166 (£4,814); United States, £5,359 (£712); Germany, £913 (£796); other foreign countries, £2,422 (£2,198).

BRITISH ELECTRICAL EXPORTS DURING OCTOBER

Destination	Goods and apparatus, Oct., 1935.	Inc. or dec. compared with Oct., 1934.	Electric generators, Oct., 1935.	Inc. or dec. compared with Oct., 1934.	Motors, Oct., 1935.	Inc. or dec. compared with Oct., 1934.	Other electrical machinery, Oct., 1935.	Inc. or dec. compared with Oct., 1934.
Irish Free State	£61,050	+ £3,629	*	—	*	—	*	—
Union of South Africa	140,241	— 21,928	£15,130	— £912	£25,232	+ £204	£99,820	+£62,186
British India	141,871	+ 24,297	7,370	+ 3,301	23,341	+ 6,339	32,743	+ 1,067
British Malaya	14,484	— 2,862	*	—	*	—	2,988	— 4,389
Ceylon	5,389	— 998	*	—	*	—	*	—
Hong Kong	4,754	— 1,497	*	—	*	—	*	—
Australia	141,204	+ 49,111	4,426	— 1,241	12,343	+ 2,095	10,983	— 7,144
New Zealand	46,127	+ 6,692	*	—	4,070	+ 352	15,956	+ 11,007
Canada	6,960	+ 796	645	+ 278	3,864	— 907	1,141	+ 83
Other British Countries	69,902	+ 4,867	13,212	+ 8,030	9,733	— 3,388	18,994	+ 448
Sweden	27,794	— 5,630	*	—	*	—	*	—
Denmark	9,191	— 4,237	*	—	*	—	*	—
Belgium	17,226	— 4,117	*	—	*	—	*	—
France	24,075	+ 11,212	*	—	*	—	2,098	— 344
Spain	20,274	+ 13,755	*	—	*	—	*	—
Italy	12,591	— 28,554	*	—	*	—	*	—
Greece	3,084	— 404	*	—	*	—	*	—
Egypt	13,595	+ 2,589	*	—	*	—	1,634	— 2,176
China	19,806	— 1,106	*	—	*	—	1,983	— 942
United States	2,581	+ 882	*	—	*	—	*	—
Argentina	21,363	— 3,679	*	—	2,143	+ 579	815	— 744
Soviet Union	*	—	*	—	24	+ 24	280	+ 216
Netherlands	*	—	225	— 604	*	—	419	— 706
Other Foreign Countries	158,659	+ 45,211	13,380	+ 5,418	11,839	— 1,360	30,554	+ 4,908
Total	£962,221	+£88,029	£54,388	+£14,270	£92,589	+ £3,938	£220,411	+£63,470

* Not classified separately.

the value of that for the corresponding period of 1934 (figures in parentheses):—

Rubber-insulated wires and cables:—British India, £35,833 (£17,607); Australia, £28,906 (£24,762); South Africa, £22,613 (£24,893); New Zealand, £5,950 (£5,115); other British countries, £12,239 (£14,004); foreign countries, £8,996 (£7,492).

Electric wires and cables (insulation other than rubber):—British India, £27,211 (£29,219); South Africa, £25,684 (£26,365); Australia, £22,415 (£13,008); other British countries, £12,210 (£10,642); foreign countries, £12,792 (£10,046).

All classes of machinery showed an advance, and the total of £367,388 may be regarded as distinctly satisfactory.

Turning to imports, the figures show that radio apparatus, lighting equipment and unenumerated goods accounted for £75,549 out of the £80,690 increase compared with October, 1934. The United States again headed the list as the principal source from which the goods and apparatus were obtained, as will be seen in the following analysis (October, 1934, figures in parentheses):—

Electrical goods and apparatus.—United States, £101,160 (£76,165); Germany, £84,286 (£75,391); Netherlands, £71,390 (£61,097); Switzerland, £19,417 (£17,875); Austria, £12,696 (£8,014); France, £11,790 (£11,188); Belgium, £10,959

So far this year the total value of exports is £11,035,542 compared with £9,011,642 in the corresponding period of 1934, representing an increase of £2,023,900 (22.5 per cent.). Imports amounted to £2,972,298 compared with £2,903,037, an increase of £69,261 (2.4 per cent.).

Metal Wall Plugs

A new method of plugging walls for fixing screws and nails has been introduced by the Wall Plug Co., Ltd., London, N.7. The plugs employed are made of a lead alloy with an outer covering of carborundum. While the lead expands the carborundum gives a firm grip and prevents the plug rotating while the screw is being driven home. These "Plugit" plugs are made in 3-in. lengths and can be cut with a penknife quite easily.

A special drill is provided which is designed to be used in a brace to bore holes rapidly in tiles, brick, marble, &c. It can, however, be used as a jumping bit if desired and is provided with the necessary holder for the purpose.

At present complete outfits are being sold but two larger sizes are in course of production. The sole distributors are MESSRS. STANLEY A. BEVIN, LTD., Lion House, 72-5, Red Lion Street, London, W.C.1.

In the Courts

BEFORE Judge Cecil Whiteley, K.C., at the Central Criminal Court recently, William Bates, 69, pleaded guilty to a charge of uttering a letter demanding with menaces a sum of £200 from a cable company. Mr. Anthony Hawke, prosecuting, said that the defendant had been an electrical engineer and was obviously well acquainted with the process of laying h.p. cables. Some cables were being laid by the company in the Harlesden district and any interference with the cables would have resulted in the gravest chaos. On October 15th the defendant wrote a letter to the headquarters of the company at Southampton, purporting to come from "High-Tension Jack." Mr. Hawke said that any interference with the cables would probably have meant a loss to the company of £20,000. Bates asked for £200 to be sent to him adding that "it would save trouble."

Mr. Lawrence, for the defendant, said that the idea came into his client's head because near the house where he lived cable-laying was in process. He committed the offence in an idle moment. It was, in fact, a "try-on."

The Judge sentenced Bates to a term of six months' imprisonment.

Sale Electricity Undertaking

In the House of Lords on November 14th the Altrincham Electric Supply Ltd., appealed from a majority judgment of the Court of Appeal reversing a judgment of Mr. Justice Farwell in the Chancery Division. The respondents were the Sale Urban District Council, and the question to be decided was the terms upon which the Sale U.D.C. had to pay for acquiring that part of the appellant company's undertaking which was within the Council's area.

The arbitrator (Mr. E. W. Lavington) decided that under Section 58 of the Ashton-on-Mersey Electric Lighting Order, 1896, the Sale U.D.C. had to pay the appellant company £109,924 and the costs of the arbitration, and the Council's contention was that the price was too much as the award of the arbitrator included, in addition to the undertaking in the area of the Council, land, works and plant outside the district that were also used for the supply of Timperley. The Council contended that the arbitrator's alternative award for £55,667 was the proper sum it had to pay for its acquisition of that part of the company's undertaking which was within its area. Mr. Justice Farwell held that the arbitrator was right and that his award must stand. He said that the only question for decision was the true meaning of the language used in the Act of 1896, and in his opinion the word "undertaking" could only mean the whole undertaking, and he could see no justification for holding that it meant that part of the undertaking which it was proposed the Council should purchase. From this result the Sale U.D.C. appealed to the Court of Appeal, which, by a majority, allowed the Council's appeal. The Electric Supply Co. now appealed, asking that Mr. Justice Farwell's judgment should be restored.

Mr. Tyldesley Jones, K.C., Sir William Jowitt, K.C., Mr. J. H. Thorpe and Mr. H. F. Bidder appeared for the appellant company, and Mr. Wrottesley, K.C., Mr. Radcliffe, K.C., and Mr. M. Fitzgerald for the respondent Council.

Mr. Tyldesley Jones, K.C., for the company, said that the question to be decided was whether the price to be paid should be a sum equal to the total expenditure on the whole undertaking or a sum equal to the expenditure on a part of the undertaking. This depended upon the construction to be put upon Section 58 of the Ashton-on-Mersey Electric Lighting Order of 1896, by which the appellant company was authorised to supply electricity in an area comprising the district of the Ashton-on-Mersey U.D.C. and the parish of Timperley in the Bucklow Rural District. The Ashton-on-Mersey U.D.C. and the Sale U.D.C. were united into one urban district, called the Sale Urban District. In January, 1933, the respondents gave the appellants six months' notice, with the consent of the Electricity Commissioners, to purchase that part of the appellants' undertaking in the Sale Urban District and which formerly comprised the Ashton-on-Mersey district.

Mr. Jones contended that the majority decision of the Court of Appeal was wrong and that the decision of Mr. Justice Farwell was right, because the words in the 1896 Order, "total expenditure of the undertakers upon the undertaking," meant the total expenditure on the whole undertaking authorised by that Order.

At the conclusion of the arguments on November 15th, on behalf of the appellant company, Mr. Wrottesley supported the majority judgment of the Court of Appeal, and the further hearing was adjourned until November 20th.

Fraud on Electrical Firm

For posing as a partner of a fictitious firm and obtaining electric lamps on two occasions from Messrs. Cameron & Robertson, electrical engineers, Main Street, Cambuslang, Robert Crawford, described as a B.Sc. of Edinburgh University, was sentenced last week to thirty days' imprisonment. The accused put through two calls by telephone and stated that he was a partner in the Durham Electrical Co., and wanted the lamps for an urgent job, the cost being £3 8s. 6d. It was found out later that no such firm existed.

Peru's Electrical Imports

PERU'S electrical imports showed a further increase in value in 1934, namely, to 4,489,000 soles (£255,000) as compared with 2,604,000 soles (£150,000) in 1933. The principal participating countries in 1934 were the United States 2,248,000 soles (1,200,000 soles in 1933), Germany 519,000 soles (439 soles in 1933), Canada 230,000 soles (128,000 soles in 1933), United Kingdom 325,000 soles (210,000 soles in 1933), and Japan 128,000 soles (97,000 soles in 1933). These figures cover "apparatus and appliances."

Heavy plant seems to be included under a general heading of "machinery for industry." The values of the principal groups in 1934 are shown below, together with a note of increases or decreases compared with 1933. (17½ soles = £1.) It will be noticed that recovery has taken place in practically every group, but that Great Britain's share in the trade is still small.

	1934 Soles (thous.)	Inc. or Dec. Soles (thous.)
Switches, circuit-breakers and similar accessories—		
Total	301	+ 116
From Germany	87	+ 37
„ Czechoslovakia	2	+ 1
„ United States	120	+ 18
„ United Kingdom	37	+ 27
„ Japan	12	+ 3
Accumulators and batteries—		
Total	293	+ 7
From Germany	20	— 1
„ United States	203	— 9
„ United Kingdom	26	+ 8
„ Japan	12	+ 7
Insulators—		
Total	65	+ 25
From United States	26	+ 12
„ United Kingdom	17	+ 5
„ Germany	16	+ 10
Insulated wire—		
Total	255	+ 90
From Germany	92	+ 46
„ United States	63	+ 15
„ United Kingdom	17	+ 7
„ Holland	12	+ 4
Telegraph apparatus—		
Total	27	+ 2
From United States	20	+ 13
„ United Kingdom	4	—
Telephone apparatus—		
Total	192	+ 88
From Belgium	151	+ 120
„ United States	18	+ 8
„ United Kingdom	18	+ 7
Wireless-telephone apparatus—		
Total	918	+ 604
From Germany	9	+ 5
„ United States	808	+ 513
„ United Kingdom	91	+ 83
Heating and cooking apparatus—		
Total	326	+ 179
From Germany	7	+ 3
„ United States	272	+ 157
„ United Kingdom	4	+ 2
„ Switzerland	22	—
Unspecified electrical goods—		
Total	113	+ 60
From United States	59	+ 45
„ Sweden	15	+ 2
Cable—		
Total	300	+ 38
From Germany	30	+ 12
„ United States	21	+ 5
„ United Kingdom	27	— 37
„ Italy	162	+ 57
Flex—		
Total	46	+ 27
From Germany	25	+ 13
„ Italy	2	—
„ United Kingdom	2	+ 1
Insulating tape—		
Total	21	+ 1
From Germany	4	— 3
„ United Kingdom	1	— 1
„ United States	14	+ 3
Ammeters, galvanometers, etc.—		
Total	57	+ 32
From United States	44	+ 28
„ United Kingdom	5	+ 1
Lamps, up to 50 W.—		
Total	241	+ 8
From Germany	57	+ 23
„ United States	64	+ 11
„ United Kingdom	9	— 2
„ Holland	23	— 7
„ Japan	66	—
Lamps, over 50 W.—		
Total	150	— 4
From Germany	24	+ 11
„ United States	57	+ 15
„ United Kingdom	9	+ 3
„ Holland	32	— 46
„ Japan	13	+ 7
House current meters—		
Total	103	— 22
From Germany	19	— 72
„ Canada	83	+ 51
Magnetos—		
Total	49	+ 25
From United States	41	+ 21
Electro-magnetic apparatus—		
Total	28	+ 21
From United States	21	+ 21
„ Germany	5	— 2
Fractional h.p. motors—		
Total	30	+ 3
From United States	18	— 6
„ United Kingdom	8	+ 8
Switchboards—		
Total	361	+ 297
From Germany	2	— 11
„ United States	45	+ 13
„ United Kingdom	23	+ 5
„ Belgium	257	+ 257
Transformers—		
Total	90	+ 1
From Germany	7	— 25
„ United States	49	+ 5
„ Switzerland	23	+ 13
Insulating tubes—		
Total	30	—
From Germany	12	— 1
„ United States	10	— 5
Fans—		
Total	6	—
From United States	3	— 2
Machinery for industry (other than textile, agriculture, mining, meat-packing and printing)—		
Total	3,840	+ 1,369
From Germany	1,164	+ 844
United States	1,367	+ 581
United Kingdom	830	— 34

Business and Industrial Notes

The Week's News. Showrooms and Exhibitions. New Installations. Overseas Trade. Publicity Material. Trade Announcements. Prices of Materials. Liquidations and Bankruptcies.

Employment in October

Employment in the engineering industry showed some further improvement in all the principal sections during October. As compared with a year ago, states the *Ministry of Labour Gazette*, it was better in all sections of the industry and in all administrative divisions. The number of unemployed in the engineering industry fell by 7,338 to 103,210, and the percentage from 11.2 to 10.5 (13.2 per cent. in October, 1934). In the electrical engineering section the number of unemployed was 5,243, or 5.6 per cent., as against 6.1 per cent. in the previous month and 6.9 per cent. a year ago. The unemployed in the electrical wiring and contracting industry totalled 4,661, the percentage falling from 15.2 to 13.2 (13.3 in October, 1934). In the electric cable, apparatus, lamps, &c., group the number of unemployed was 10,242, the percentage being 7.2, against 6.8 in the previous month and 7.3 per cent. in October, 1934.

An Electrical Exhibition at Manchester

The first of four local electrical exhibitions to be organised this winter by the Manchester Corporation Electricity Department under the supervision of Mr. H. C. Lamb, the chief engineer and manager, was held at the Chorlton Baths, Manchester, from November 4th to 8th. Others to follow will be at Levenshulme, Moston and Rusholme. Sixteen such exhibitions have been held during the last four years, the object being to give the public an opportunity of examining the latest developments in electrical appliances for use in the home, and to advertise the various service facilities provided by this undertaking. Local exhibitions are regarded as valuable propaganda and serve as an adjunct to the electricity showrooms in the city, which, in spite of publicity, many consumers never visit. In addition to model rooms furnished and equipped as an example of a small house fitted up for all-electric service, separate stands were devoted to lighting, heating, cooking, water heating, washing and cleaning, appliance repairs service, home aids (various domestic labour saving devices), shop window lighting and the E.D.A. mechanical window (electric house). Continuous demonstrations were given of cooking, home laundry, vacuum cleaning, water heating and repairs of electrical appliances. The repair service exhibit was arranged to advertise the facilities provided by the Department. A cake baking competition was held, for which three prizes were awarded for the best cakes baked in an electric cooker, and seventy-five entries were received. The whole of the stand fitting and wiring was undertaken by the Department's own staff and workmen, and, with the exception of the vacuum cleaner and washing machine stands, which were staffed by manufacturers, all the exhibits were provided and supervised by the Electricity Department. The stands, which have been made for use at future exhibitions, were built in sections, so as to facilitate erection and dismantling. Over 2,000 people visited the show in the five days of its duration, in addition to 200 school children. A visit was paid on November 7th by the E.D.A. Sales and Maintenance Staffs Conference, North-West Area, after a meeting at the electricity showrooms, when a discussion on "The Organisation of Local Electrical Exhibitions" was opened by Mr. G. A. Proctor, sales manager, Manchester Electricity Department.

The electrical exhibition recently held at the Chorlton Baths, Manchester

The Radiological Exhibition

The ninth annual congress and exhibition of X-ray equipment, to be held under the auspices of the Institute of Radiology, are to take place at the Central Hall, Westminster, from December 4th to 6th. The exhibition will be open on each of the three days, concluding with a reception, dinner, and ball. Besides papers on therapeutics and diagnostics, there will be papers by Dr. J. Read on high-voltage X-ray tubes in the U.S.A., and by Dr. L. H. Gray on the ionisation method of gamma-ray energy measurement. In the eighteenth Silvanus Thompson memorial lecture Dr. G. W. C. Kaye will review "Forty Years of Radiology."

E.D.A. Activities

The eighth annual carnival ball under the auspices of the Northern Counties Area Committee of the British Electrical Development Association will be held in the Oxford Galleries, Newcastle-on-Tyne, on January 10th. The proceeds of this function go to electrical charities, and this year the ball promises to be one of Newcastle's brightest events. Tickets, at 5s. each, will be available on and after December 1st from Mr. A. Parkin, E.D.A., Area Officer, 47, Pilgrim Street, Newcastle-on-Tyne.

The December Sales and Publicity Programme of the British Electrical Development Association is naturally devoted to the sale of electrical appliances as Christmas gifts and it illustrates some of the ways in which the Association can help to this end. Four special window displays have been prepared and for those who do not desire the full schemes, a number of display units are available. A Christmas gift poster shows a successful method of using the "showroom poster" which the Association recently produced, on which space is available for the dealer's name and address. A number of Christmas advertisements are available for insertion in the local Press. Special attention is drawn to the gift number of "Electrical Housekeeping," and particulars and prices of the two calendars for 1936 are again given. The prices for various quantities of the gramophone record "Plenty of Time for Play" are included.

German Cable Exports

After the decline in recent years the exports of cables from Germany have begun to improve. The quantity exported in the last quarter in 1934 amounted to 4,295 tons and rose to 4,665 tons in the first three months of 1935, 5,978 tons in the second quarter and 7,695 tons in the third quarter, while the figures for electrical conductors were 2,958 tons, 3,011 tons, 3,423 tons and 3,749 tons in the four periods respectively. The total value of the exports of cables in the nine months to the end of September was 8.69 million Rm. and that of conductors was 8.36 millions.

Polish Electrical Industry

As a result of the decrease in the imports of electrical manufactures and the larger home demand the Polish electrical industry is stated to be well employed at the present time. During the past twelve months five new works have been established, making sixty-three in all, while the number of persons employed has increased by 28 per cent. to 8,761. The most favourable development has taken place in the radio industry.

The Ruston-Lister Agreement Terminated

Messrs. Ruston & Hornsby, Ltd., and R. A. Lister & Co., Ltd., announce that the rationalisation agreement entered into between them in 1930 is being terminated by mutual consent on March 31st next. The reason for the termination, we are advised, is a gradual change in the basic factors affecting the respective businesses which could not have been envisaged at the time the agreement was entered into. It has therefore been felt by the boards of both companies that their individual and joint interests will be best served by the termination.

An Electrical Diary

An electrical pocket diary for 1936, neatly bound in dark green leatherette, has been published by Letts Quikref Diaries, Ltd. (price 2s. 6d.). This contains 140 pages of electrical information edited by Mr. E. Mallett, D.Sc., M.I.E.E., A.M.I.C.E., and gives in condensed form the most generally used facts and formulæ. It is divided into seven sections as follows:—Electricity and magnetism; electrical machinery and transformers; power distribution; batteries; illumination; electrical wiring of buildings; and mathematical and electrical tables. The usual diary information is included.

Orders Recently Booked

Lancashire Dynamo & Crypto, Ltd., has in hand a considerable quantity of electrical plant for various colonies, including an order for four 1,000 b.h.p. squirrel-cage motors, for the Rhokana Corporation, South Africa. These machines are for working at an altitude of 4,000 ft. above sea level and the mechanical design is such that, when dismantled, the various parts will pass through a pit shaft 6 ft. 6 in. by 4 ft. 6 in. The motors will drive Sulzer pumps, auto transformer starters being used.

Two further important contracts have been secured by Messrs. Babcock & Wilcox, Ltd. The first is for four water-tube boilers for the Yoker power station of the Clyde Valley Electrical Power Co., which will be of a new type capable of evaporating 100,000 lbs. of water per hour. The second contract is for two more seaplane lifting cranes for the Admiralty. These cranes, which will be electrically driven, will be installed on one of the seaplane carriers of the Royal Navy.

The Holland America Line is building a new liner in Holland and has decided to adopt boilers of the latest Yarrow water tube type. These boilers will be built under licence from Messrs. Yarrow & Co., Ltd., who supply the main designs.

Lamp Publicity

The General Electric Co., Ltd., has decided to embark on an extensive poster campaign in which it is making a feature of the Osram "Carton of Light" idea, associated with its 1935-6 "Osram" lamp sales campaign.

Social Events

Although it was staged on November 13th and the cast comprised thirteen players, the only unfortunate thing about last week's production of the Lewcos Dramatic Society is that we shall now have to wait four months before we are given another opportunity of seeing these excellent artists in action. As Mr. Ernest Leete, the president, expressed it, Ian Hay's "The Happy Ending" was a very good play enacted by very good players. That the audience—the Guildhall School of Music and Drama was well filled for the occasion—enjoyed what they saw was obvious from the fact that many an eye was moist when the "happy" ending arrived! We were pleased to see two or three former acquaintances once again, including that versatile actor Mr. S. Graefe, but the greater part of the cast comprised newcomers, among them being a very able leading lady in Miss M. Craddock. The play was produced by Mr. W. F. Humphreys.

We spent a pleasant evening on Tuesday last at the works hall of the Telegraph Construction and Maintenance Co., Ltd., Greenwich. The occasion was the first anniversary of the Telcon Social and Athletic Club which took the form of a smoking concert, during which cups and prizes for cricket, snooker, golf and shooting were presented. Mr. C. J. C. Padfield presided, and among those present were Mr. C. F. Campbell (chairman of the company), Sir Geoffrey Clarke (managing director), Major H. Denison-Pender (director), and Mr. L. J. Ransom (works manager). Sir Geoffrey Clarke in a brief speech referred to the difficult times through which the company had passed and the improved position as a result of increased business during the past year; they could look hopefully to the future. Mr. Campbell, in presenting the prizes, said the company had started on a prosperous era, and he thought that now they had embarked on the manufacture of power cables the future was bright. The board took a keen interest in the activities of the club which he considered an excellent thing, as he realised that it was a safety valve for those who felt the strain of work. The concert was given by a number of well-known artistes, who were enthusiastically received.

Trade Announcements

The Steel Band Conveyor & Engineering Co., Ltd., has removed to Dawlish Road, Selly Oak, Birmingham.

Messrs. E. P. Allam & Co., Ltd., have removed to larger offices at 6, Great James Street, Bedford Row, London, W.C.1, and have taken larger works and stores at 11, North Mews, Gray's Inn Road, London, W.C.1. Their motor repairing department has also been extended.

To cope with increasing business, the Electro-Dynamic Construction Co., Ltd., is to move early in the New Year to a new factory now being erected at St. Mary Cray, close to the railway station. The additional space available will permit the expansion of the company's activities to include several new products.

New Showcards

Thermega, Ltd., has issued two new showcards advertising its electric blankets and pads. These show a charming brunette in bed with a "Thermega" pad at her back, and an electric blanket by the side of the bed within easy reach.

Wireless Valves

The issue of *The Wireless World* of November 22nd is a special number devoted to the subject of valves. A 24-page Supplement is included which gives in a concise form all the essential data required by set designers and users concerning all types and makes of modern British receiving valves. In addition, the issue contains a number of special articles on valves and a useful section which illustrates the valve-base connections in association with the symbols used in circuit diagrams for each valve type.

The Australian Tariff Board

H.M. Trade Commissioner at Sydney has advised the Department of Overseas Trade that reference has been made to the Australian Tariff Board of a request by Messrs. McColl Electric Works, of Melbourne, for the removal from by-law admission under tariff item 174 Y of "electric motors, single-phase, repulsion-induction, commutator type, 3 h.p. to 5 h.p." At present these motors are accorded by-law admission, duty-free British preferential, and 15 per cent. *ad valorem* general rate, under item 174 Y. Should the present application succeed, however, they would presumably be placed under any such duty-bearing item as the Tariff Board might deem suitable.

An Electric Water-heating Display

The accompanying illustration shows the stand of the Reigate Corporation Electricity Department at a recent exhibition promoted by the local Chamber of Trade at Redhill. The stand was exclusively equipped with "Charlton" electric water heaters made by Messrs. Johnson & Phillips, Ltd., and the 1½-gal. models shown in the foreground were all actually working. The Corporation Electricity Department sent out special circulars to every consumer giving information on electric water heating to support the exhibit.

"Charlton" water heaters exhibited by the Reigate Electricity Department

Radio Component Standards

During the past year the Radio Component Manufacturers' Federation has registered the "R.C.M.F." standardisation mark under the Trade Marks Act. Copies of the rules for applying this mark are now available, together with further standards which have been issued during the past year. The secretary's address is 83, Cannon Street, London, E.C.4.

A Window Dressing Competition

The Ever Ready Co. (Great Britain) has sent us a list of successful competitors in its window-dressing competition held throughout the country. This contains the names of fifty-six dealers, the prizes ranging from £75 to £7 10s. In addition, a large number of prizes were awarded for the phrase-compiling competition.

The New Derby Demonstration Hall

On Monday this week a new demonstration hall at the showrooms of the Derby Corporation Electricity Department was officially inaugurated. Spaciousness, we think, is the outstanding feature of this new hall. The 150 permanent seats offer plenty of knee room, and there are wide gangways at the back and front. A big central lay-light longitudinally arranged in the auditorium ceiling is equipped with ordinary "daylight" lamps, and the illumination from these alone is 20 ft.-candles at the level of the seats; the excellent "effect" lighting must considerably supplement this figure. There is cornice lighting around the walls, and, under this, recessed equipment in the horizontal plane with coloured glass panels. "Sunset" and "sunrise" effects by recessed wall equipment at the back of the hall enhance the general scheme, while architectural lamps give definition to the proscenium. At the front of the stage there is a shutter which, when opened,

The new Derby demonstration hall

automatically brings stage flood-lighting equipment into position for immediate use. A separate sound-proof room is being equipped for amplification of the lectures in the hall, but we understand that Mr. F. Nicholls, the borough electrical engineer, also has in mind the possibilities of using the room for electrically record-

ing the lectures given in the main hall. The amplification equipment was supplied by the General Electric Co., Ltd. For warming the hall a hot-water wall circulation system is served by a 60-kW electrode boiler supplied by Messrs. Bastian & Allen, Ltd., which operates in conjunction with a 700-gal. tank on the night storage principle. The hall measures 65 ft. by 35 ft., and the stage is 25 ft. wide and 18 ft. deep. The new hall will be mainly devoted to cooking demonstrations and lectures on domestic subjects generally.

For Sale

Messrs. Goddard & Smith will sell by auction at 70, Seymour Place, W., a large stock of electrical material.

Chester Electricity Department has for disposal three 1,000-kW rotary convertors.

(See our classified advertisements.)

Local Exhibitions

Liverpool Corporation Electric Supply Department has a large stand at the Liverpool Grocers' and Allied Trades Exhibition now being held in Renshaw Hall, Liverpool. The apparatus on view includes domestic and commercial appliances, including a range of radiators suitable for shop purposes as well as water heaters.

An all-electric house, completely equipped with the latest in lighting, heating and cooking equipment and high-grade furnishings, is one of the features at a "Brighter Homes" Exhibition which opened on November 19th at the Manningham Rink, Bradford, and remains open until November 30th. The house was equipped under the auspices of the Bradford Corporation Electricity Department.

Commercial Electrical Travellers

The annual dinner of the Electrical Trades' Commercial Travellers' Association will be held on February 21st at the Connaught Rooms, W.C.

As a result of its recent performances of "The Last of Mrs. Cheyney," the G.E.C. Dramatic Society has forwarded the sum of £45 to the charities of the Association.

Prices of Materials

The following prices are only general, and they may vary according to quantities and other circumstances:—

CHEMICALS, ETC.	Price, November 20th.	Fortnight's Inc. or Dec.
[a] Acid, Oxalic ... ... per cwt.	50s.	—
[a] Ammoniac, Sal ... ... per ton	£36	—
[a] Ammonia, Muriate (large crystal) ... ,,	£18 10s.	—
[a] Borax ... ... ,,	£17	—
[a] Copper, Sulphate ... ... ,,	£15 10s.	—
[a] Potash, Chlorate ... ... per lb.	3½d. to 4½d.	—
[a] ,, Perchlorate ... ... ,,	6d.	—
[a] Shellac ... ... per cwt.	£4 18s.	—
[a] Sulphur Commercial... ... ... per ton	£11	—
[a] ,, Roll ... ... ,,	£11	—
[a] Soda Chlorate ... ... per lb.	3¼d. to 3½d.	—
[a] ,, Crystals... ... ... per ton	£5 to £5 5s.	—
[a] Sodium Bichromate, casks ... ... per lb.	4d. nett.	—
METALS, ETC.		
[b] Aluminium, Ingots ... ... per ton	£100 to £105	—
[b] ,, Wire ... ... per lb.	1/1 to 1/9	—
[b] ,, Sheet and Foil... ... ... ,,	1/2 to 2/9	—
[p] Babbitts Metal and Anti-friction Metals—		
Grade I ... ... per ton net	£213	£6 inc.
Grade II ... ... ,,	£146	£4 inc.
Grade III ... ... ,,	£76	£1 inc.
[c] Brass (rolled metal 2" to 12" basis) per lb.	7¼d.	—
[c] ,, Tubes (solid drawn) ... ... ,,	9½d. to 10d.	—
[c] ,, Wire, basis ... ... ,,	7¾d.	—
[c] Copper Tubes (solid-drawn) ... ,,	10½d.	—
[g] ,, Bars (best selected)... ... per ton	£66	£2 dec.
[g] ,, Sheet... ... ... ,,		
[g] ,, Rod ... ... ,,		
[d] ,, (Electrolytic) Bars ... ... ,,	£40	5s. dec.
[d] ,, ,, Wire Rods ... ,,	£45	5s. dec.
[d] ,, ,, H.C. Wire ... per lb.	7¾d.	—
[f] Ebonite Rod ... ... ,,	1/6 to 2/- plus	—
[f] ,, Sheet ... ... ,,	1/3 to 1/6 10%	—
[n] German Silver Wire ... ... ,,	2/5	—
[h] Gutta-percha, fine ... ... ,,	nom.	—
[h] India-rubber, Para-fine ... ... ,,	6½d.	½d. inc.
[i] Iron, Pig. (Cleveland No. 3) ... per ton	67/6	—
[i] ,, Wire galv. No. 1, P.O. Qual.... ,,	£20	—
[g] Lead, English Pig ... ... ,,	£20	10/- inc.
[g] Mercury ... ... per bot.	£11/15 to £12	—
[e] Mica (in original cases) small ... per lb.	6d. to 1/-	—
[e] ,, ,, medium ... ,,	5/- to 10/-	—
[e] ,, ,, large ... ,,	10/6 to 17/6 up	—
[p] Phosphor Bronze, plain castings ... ,,	1/1	—
[p] ,, ,, drawn bars & rods ,,	11¾d.	—
[p] ,, ,, rolled strip & sheet ,,	11¾d.	—
[p] ,, ,, wire ... ... ,,	1/0½	—
[o] Platinum ... ... per oz.	£7 17s. 6d.	—
[d] Silicium Bronze Wire ... ... per lb.	8½d.	½d. dec.
[g] Spelter ... ... per ton	£16 2s. 6d.	—
[r] Steel, Magnet, in bars ... ... per lb.	7¼d.	—
[g] Tin, Block (English) ... ... per ton	£229	£5 10s. inc.
[n] ,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	—

Quotations supplied by:—

[a] G. Boor & Co.
[b] The British Aluminium Co., Ltd.
[c] Thos. Bolton & Sons, Ltd.
[d] Frederick Smith & Co.
[e] F. Wiggins & Sons.
India Rubber, Gutta Percha, and Telegraph Works Co., Ltd.
[g] Henry Gardner & Co., Ltd.
[h] Edward Till & Co.
[i] Bolling & Lowe.
[n] P. Ormiston & Sons.
[o] Johnson Matthey & Co.
[p] C. Clifford & Sons, Ltd.
[r] W. F. Dennis & Co.

The above table is published here fortnightly. In alternate issues, in which it does not appear, the latest prices of copper, silicium bronze wire, lead, rubber, tin and spelter, up to the time of going to press, are given in our "Business Notes" under the same heading.

New Rumanian Lamp Works

Besides the Rumanian Petrosani mining company, which has received a concession for the establishment of an electric lamp works, the Rumanian subsidiary of the Ver. Gluhlampenfabrik of Ujpest, has also obtained a similar concession. A third scheme is projected by Dr. Andreas Princz under the title of the Eterna S.A.R., in Klausenburg.

Advertisement Correction

We are asked to state that the advertisers' address was omitted from the announcement of Messrs. Rowlands' Electrical Accessories, Ltd., on Supplement p. 30 of our last issue. It is R.E.A.L. Works, Hockley Hill, Birmingham, 18.

Showrooms for Walton-on-Thames

The Walton-on-Thames Electricity Committee recommends the purchase from the Ashley Park Estate Co. of a site for showrooms and offices.

A Bristol Window Display

The accompanying illustration shows an electrical display arranged by Messrs. Gardiner, Sons & Co., Ltd., of Bristol,

An electrical display by Messrs. Gardiner, Sons & Co. at Bristol

during the opening week of the E.A.W. all-electric, £1,000, demonstration house, for which the company supplied the electric lighting fittings and many of the domestic appliances.

New Catalogues and Lists

Hornby Electrical Supplies Co., Ltd., 77, Dean Street, London, W.1.—A comprehensive general electrical catalogue (144 p.).

Higgs Motors, Ltd., Witton, Birmingham, 6.—A leaflet on bench grinders and drilling machines.

Renold & Coventry Chain Co., Ltd., Didsbury, Manchester.—A booklet in photogravure depicting applications of chain drives.

A. P. Lundberg & Sons, Ltd., 477, Liverpool Road, Holloway, N.7.—A pocket catalogue of electrical accessories and "quantity" price sheets.

B.E.N. Patents, Ltd., Gorst Road, Park Royal, London, N.W.10.—A leaflet on two-stage air compressors.

Burgess Products Co., Barwell, Leicester.—Leaflets relating to a flashlight screwdriver, the "Keelite" and the "Snaplite."

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Two publications dealing in detail with industrial cooking and electric baking equipment. Also a descriptive leaflet illustrating cinema studio lighting equipment.

Stewart & Lloyds, Ltd., 41, Oswald Street, Glasgow.—A complete bound catalogue (pp. 156) of tubular steel poles. Many new poles are listed and the trolley pole tables have been revised.

British Insulated Cables, Ltd., Prescot.—New booklets dealing with radio materials and wiring systems.

W. T. Henley's Telegraph Works Co., Ltd., Holborn Viaduct, E.C.1.—A leaflet describing a new restaurant type waffle maker.

International Combustion, Ltd., Aldwych House, London, W.C.2.—An illustrated art catalogue of drag scrapers.

Sun Electrical Co., Ltd., 118, Charing Cross Road, London, W.C.2.—A catalogue (pp. 64) of domestic, commercial and industrial heating equipment; illustrated and priced.

Callender's Cable & Construction Co., Ltd., Hamilton House, Victoria Embankment, London, E.C.4.—A catalogue of automobile cables.

F. W. Lechner & Co., Ltd., 61, Spencer Street, Clerkenwell, E.C.1.—A reprint from the *Wireless World* dealing with "Erka" toroidal mains transformers.

Ferguson, Pailin, Ltd., Higher Openshaw, Manchester, 11.—Catalogue sections dealing with oil circuit-breakers, operating mechanisms, time-limit fuse boxes, and the application of cross jet pots to duplicate oil circuit-breakers.

Electrical & Auto Products (1931), Ltd., 230, Deansgate, Manchester.—A leaflet on an electrical test bench for garages.

British Aluminium Co., Ltd., Adelaide House, King William Street, London, E.C.4.—A new booklet (pp. 64) on aluminium in shop fitting and display containing many striking illustrations.

Bankruptcy Proceedings

F. S. S. Wates, wireless set manufacturer, late of 184-8, Shaftesbury Avenue, London, W.C.—This bankrupt, who failed in August, 1934, applied on November 12th to Mr. Registrar Mellor at the London Bankruptcy Court for an order of discharge. The Official Receiver reported that the provable debts amounted to £1,215, and the assets had realised £18. The applicant began business in 1919, dealing in wireless equipment and accumulators. In 1923 he sold that business to Wates Bros., Ltd., for £4,998 in shares. The company went into voluntary liquidation in 1926, when the bankrupt commenced producing wet high-tension batteries, at first in the name of the Wet High Tension Battery Co., and after November, 1929, as the Standard Battery Co. The last-named business was acquired in September, 1932, for £2,000 in shares by Wates Radio, Ltd., which concern also went into voluntary liquidation in July, 1933. During 1932 proceedings were taken against the bankrupt for non-payment of royalties due under a licence granted to the Standard Battery Co. He defended the action, but judgment was entered against him for £10 and costs £181, and these bankruptcy proceedings ensued. The discharge was suspended for three months.

C. E. Keates, electrical engineer, 110, Brent Street, Hendon, N.W.—An application for an order of discharge was made on November 14th at the London Bankruptcy Court on behalf of this debtor, who failed in August, 1934. Mr. Clarke, Assistant Official Receiver, reported that the provable debts amounted to £3,095; the assets had realised £750; and a dividend of 3s. 7d. in the £ had been declared by Mr. W. A. J. Osborne, the trustee under the bankruptcy. The applicant began business on his own account in 1919, and subsequently traded both alone and in partnership. In June, 1934, he assigned his business to a company for £695, payable by instalments, but the trustee challenged the transfer and accepted £225 in settlement of the claim. The debtor attributed his failure to bad trade, heavy overhead expenses, and illness. The discharge was suspended for six months.

A. J. Penn (Northampton Installation Co.), electrical engineer and contractor, 26B, Barrack Road, and 43, Gladstone Terrace, Northampton.—Receiving order made November 12th on debtor's own petition.

S. Rutland, electrician, 39, Hathaway Road, Grays, Essex.—First meeting November 22nd at 29, Russell Square, W.C. Public examination December 5th at the Petty Sessions House, Southend.

J. H. Dinham and **J. H. Meredith** (Electra Contracting Co.), electrical contractors, 50, New Zealand Road, Cardiff.—First and final dividend of 1s. 2d. in the £ payable December 3rd at 35, Windsor Place, Cardiff.

A. E. Poole and **H. Marsters** (Poole's), electrical engineers, 33, Union Street, Wednesbury.—Last day for receiving proofs for dividend November 26th. Trustee, Mr. F. E. Bendall, 3, Warwick Passage, Corporation Street, Birmingham.

W. B. Ralphs, electrical contractor, 30, Ayresome Street, Middlesbrough.—First and final dividend of 9¼d. in the £, payable November 27th at 80, High Street, Stockton-on-Tees.

Company Liquidations

Neon Erectors, Ltd.—At the statutory meeting of the creditors of the above held on November 12th at the Victoria Hotel, Manchester, the statement of affairs showed ranking liabilities of £1,982 and net assets of £500, leaving a deficiency, so far as the creditors were concerned, of £1,482. The issued capital of the company was £2,600, and as regards the shareholders there was a deficiency of £4,082. It was reported that the company was registered on September 14th, 1934, to take over an existing business. The nominal capital was £3,000, of which £1,170 was issued for cash. The balance of the issued capital was allotted to the vendor as the consideration for the assets transferred. The creditors decided that the voluntary liquidation of the company should be confirmed with Mr. A. Yearsley, of Messrs. Trotter, Davies & Yearsley, 27, Brazennose Street, Manchester, as liquidator, together with a committee of the principal creditors.

Oldfields, Ltd.—Winding up voluntarily. Liquidator, Mr. H. B. Southam, 27, Frederick Street, Birmingham. Particulars of claims to the liquidator by November 26th.

McLeod & McLeod, Ltd.—Winding up voluntarily. Liquidator, Mr. A. R. L. Deeks, 3, Warwick Court, Gray's Inn, W.C. (Particulars of a new company—McLeod & McLeod (1935), Ltd.,—appear on p. 730 of this issue.)

Electramonic (Foreign Rights), Ltd.—Winding up voluntarily. Liquidator, Mr. A. W. Pardy, Jessel Chambers, Chancery Lane, W.C.

Edison Storage Battery Distributors, Ltd.—Winding-up voluntarily. Liquidator, Mr. V. L. Norris, 3, St. James's Square, S.W. Meetings December 13th at Victoria House, Southampton Row, W.C., to receive an account of the winding-up.

Reasonable Radio, Ltd.—Meeting December 16th at 92, High Street, Brentwood, to receive an account of the winding-up by the liquidator, Mr. P. C. Harrop.

E. Marson, Ltd.—Meeting December 16th at Balfour House, Finsbury Pavement, E.C., to receive an account of the winding-up by the liquidator, Mr. W. A. J. Osborne.

Private Arrangements

Mrs. B. F. Leyland, 90, Lark Lane, Liverpool, electrical and radio engineer.—A meeting of the creditors of the above was held on November 12th at the offices of Mr. P. S. Booth, 2, Bixteth Street, Liverpool. A statement of affairs was submitted which showed ranking liabilities of £267 with net assets of £67, leaving a deficiency of £201. Mr. Booth reported that the debtor commenced the business in August, 1932, with a capital of about £200. The business had included work for the Liverpool Corporation, such as electrical wiring on the deferred payment system. It was decided that a deed of assignment should be executed to Mr. Booth, and a composition of 10s. in the £ accepted.

Government Contracts

The following contracts were placed by various Government Departments during October :—

ADMIRALTY.

Accumulators.—Batteries, Ltd.
Motor alternators.—Newton Bros. (Derby).
W.t. amplifiers.—Radio Instruments.
Cable.—Hackbridge Cable Co.
Cable installations.—Siemens Bros.
Change-over switches.—A. Graham & Co.; Whipp & Bourne.
Electric cranes.—T. Smith & Sons (Rodley); Sir William Arrol & Co.; Stothert & Pitt; Cowans, Sheldon & Co.; Babcock & Wilcox.
Table fans.—Veritys.
Motor generator.—Laurence, Scott & Electromotors.
Electric lamps.—G.E.C.
Fuse plugs.—J. Stone & Co.; Vickers-Armstrongs.
Plugs and sockets.—Engg. & Lightg. Equipment Co.
Switchboards.—Whipp & Bourne.
Switchgear.—Ferguson Pailin.
W.t. valves.—Mullard Radio Valve Co.

WAR OFFICE.

Ammeters.—Elliott Bros.
Batteries and cells.—Britannia Batteries; Siemens Bros.
Electric lamps.—G.E.C.; J. Lucas.
Electric cables, &c.—Siemens Bros.; Enfield Cable Works; B. I. Cables; G.E.C.; Johnson & Phillips.
Carbons, &c., and w.t. valves.—G.E.C.
Inert cells.—G.E.C.; Ever-Ready Co. (Great Britain); Hellesens.
Engine and generator.—Ruston & Hornsby.

AIR MINISTRY.

Accumulators.—Oldham & Son; Batteries, Ltd.
Ammeters and voltmeters.—Metropolitan-Vickers Elect. Co.
Battery charging panels.—Erskine Heap & Co.
Terminal blocks.—Oliver Pell Control Co.; Telephone Mfg. Co.; G.E.C.
Fuse boxes.—Phœnix Telephone & Electric Works.
Underground cables for Dhibban.—Siemens Bros.
Power-hour for Dhibban.—English Electric Co.
Wiring of hutments.—Henlow: Anderson Angell & Co.: Malcolm & Allan (London). Montrose: Lowden Bros.
Wiring of station at Hullavington.—Anderson Angell & Co.
Cable.—G.E.C.
Ceiling fans.—Crompton Parkinson.
Generating sets.—New Pelapone Engine Co.; Rotax; Belliss & Morcom; Mackie & Co.
Electric lamps.—G.E.C.; Johnson & Phillips; Aldis Bros.
Motor convertor set.—Bruce Peebles.
W.t. receivers.—Marconi's; Radio Instruments; Siemens Bros.
Switchboards and magnetos.—B.T.H.
Switchboxes.—Oliver Pell Control Co.
Transmitters.—Siemens Bros.; Standard Telephones.
Transmitting and d/f station.—Plessey Co.
Wavemeters and spares.—Gambrells Rowse & Snoaden.
W.t. valves.—Marconi's; A. C. Cossor; G.E.C.; Standard Telephones; Ediswan.
W.t. equipment.—Marconi's.

POST OFFICE.

Telephonic apparatus.—Automatic Electric Co.; Ericsson Telephones; G.E.C.; Hall Telephone Accessories (1923); Plessey Co.; Siemens Bros.; Standard Telephones; Telephone Mfg. Co.
Testing and protective apparatus.—Automatic Electric Co.; Dynamo & Motor Repairs; Evershed & Vignoles; W. Jones & Co.; Phœnix Telephone & Electric Works; Power Equipment Co.; Standard Fuse Co.
Wireless apparatus.—Standard Telephones.
Cable.—Callender's; Enfield Cable Works; Hackbridge Cable Co.
Telephone cords.—Reliance Elecl. Wire Co.
Leclanché depolarising elements.—Ferguson Battery Co.; Fuller Accumulator Co. (1926); G.E.C.; I.R.G.P.; Siemens Bros.
Electric lighting fittings.—H. D. Jackson & Co.; Revo Electric Co.
Rectifiers.—Ediswan; Westinghouse Brake & Signal Co.
Cabling and loading coils.—Perth-Dunkeld: United Telephone Cables.
Cabling, loading coils and terminations.—Cambridge-Norwich: Siemens Bros.
Telephone exchange equipment.—Evington (Leicester); Largs; Burgess Hill (Brighton); Western (London); Kidderminster.—Siemens Bros. Thornton Heath (London).—Ericsson Telephones. Basford; Reigate; Mayfair (London); Widnes; West Bromwich; Manchester Directory Enquiry Bureau and toll; Newquay.—Automatic Electric Co. Coventry; Wellingborough; East (Birmingham); Reliance (London); Glasgow Central; Llandrindod Wells.—G.E.C. Norwich; London Trunk; Sloane, Finchley and Bermondsey (London)).—Standard Telephones.
Telephonic amplifier equipment.—High Wycombe: Standard Telephones.
Telephonic repeater equipment.—Edinburgh; Catterick.—Standard Telephones.
Voice frequency telegraph equipment.—Dundee; Bangor Head Post Office; Edinburgh.—Standard Telephones.

H.M. OFFICE OF WORKS.

Cable, switchgear, &c., at British Museum.—Electric Construction Co.
Cable at National Physical Laboratory.—Siemens Bros.

CROWN AGENTS FOR THE COLONIES.

Broadcasting equipment and radio transmitter.—Marconi's.
Broadcast relay materials and telephone equipment.—G.E.C.
Channel carrier equipment.—Standard Telephones.
Diathermy apparatus.—Watson & Sons (Electro Medical).
Dry core cable, &c., and telephone cable.—Siemens Bros.
Electric lighting fittings.—Troughton & Young.
Switchgear and static transformers.—B.T.H.
Telephone cable, &c.—Henley's.
X-ray equipment.—A. E. Dean & Co.

Electricity Supply

Lighting, Domestic, Power

Algeria.—RURAL SUPPLIES.—Contracts have just been placed for the supply and installation of twenty-two transformer boxes and thirty-three transformers required in connection with the extension of the electric power supply facilities in the rural areas of the Constantine district.

Ashton-under-Lyne.—TEN THOUSAND CONSUMERS.—At a radio and domestic electrical appliances exhibition held recently an electric iron and a kettle were presented to the Electricity Department's ten-thousandth consumer.

Boston.—RECENT DEVELOPMENTS.—The Town Council has accepted a tender for the lighting of several main thoroughfares with mercury electric-discharge lamps. This follows an experimental installation with seven lamps, the new scheme involving an additional 101 standards. The Boston & District Electric Supply Co., Ltd., has recently standardised tariffs for the whole of its area of 270 square miles, and has reduced the two-part tariff running charge to ¾d. per kWh. The water heating rate is now ½d. per kWh, and apparatus is supplied on simple hire. The company has received the consent of the Electricity Commissioners to a reduction in the voltage in Boston and certain contiguous parishes from 240 to 230 V.

Brazil.—HYDRO-ELECTRIC SCHEME.—A small hydro-electric station has recently been completed on the River Taquarassu at Bello-Horizonte, in the State of Minas Geraes, in connection with the mines of the Compagnia Siderurgica Belgo-Mineira. The plant comprises three 1,450-h.p. Francis-type, vertical-shaft turbines constructed by the Officine Riva, of Milan, coupled direct to A.E.G. alternators generating 2,200-V power at 600 r.p.m. under a head of about 108 ft.

Darlington.—A NEW FEEDER.—Application is to be made to the Electricity Commissioners for sanction to borrow £1,090 to cover the cost of laying a feeder from the generating station to the showrooms sub-station.

SUB-STATIONS.—The Town Council is to erect a sub-station in Haughton Road, and proposes to acquire a site in Elton Road for another sub-station.

Eyemouth.—STREET LIGHTING.—The Town Council is to have the gas street lighting replaced by electric lamps.

Farnborough.—CHEAPER ELECTRICITY AT COVE.—The Mid-Southern Utility Co. has informed the Urban District Council that, commencing with the meter readings for the Christmas quarter, consumers at Cove will be entitled to the charges ruling in the town, in place of the existing higher rates.

Glasgow.—ELECTRIC COOKING IN A HOSPITAL.—The Health Committee has agreed to the use of electricity for cooking at Cowglen Hospital, and the city engineer is to report on the approximate consumption of energy for laundry purposes.

Glendale (Northumberland).—EXTENSIONS.—The Rural District Council is to ask the North-Eastern Electric Supply Co., Ltd., to provide electricity to the outer parts of Glendale.

Glenluce (Wigtownshire).—PUBLIC LIGHTING.—The village is to have electric street lighting to take the place of oil lamps.

Great Yarmouth.—ELECTRICAL DEVELOPMENT.—At a recent meeting of the Electricity Committee the borough electrical engineer reported that, in consequence of electrical development, a loan of £43,000 would be required to meet expenditure, as follows:—mains and services (£20,000); assisted wiring (£3,000); domestic appliances (£15,000); and sub-station equipment (£5,000). The Committee approved the recommendations.

AN AMENDED AGREEMENT.—The electrical engineer recently reported to the Electricity Committee that the East Anglian Electric Supply Co., Ltd., proposed to extend its mains in the East Suffolk area from its grid connection at Stowmarket and was desirous of transferring the bulk supply now taken from the Corporation mains at Beccles to the proposed new mains. He recommended that as the increased demand from villages in the Corporation's area of supply and abutting on the route from Yarmouth to Beecles would gradually absorb the load released by the East Anglian Co., the agreement with the company should be amended as suggested. The Committee decided to negotiate with the company on the subject.

Hove.—SUPPLY TO FLATS.—The Town Council is to extend the a.c. mains from Hove Street sub-station to supply a block of flats at Viceroy Lodge, at an estimated cost of £1,757.

Jarrow-on-Tyne.—CANVASS.—The Town Council is canvassing Monkton to ascertain the demand for electricity, following a request from the Parish Council that supplies should be made available.

Keith.—STREETS TO BE LIGHTED ELECTRICALLY.—A scheme for lighting the streets of the burgh by electricity has been approved by the Town Council.

Lanarkshire.—GAS COMMITTEE TO CONSIDER ELECTRICITY RECOMMENDATIONS.—The County Council has approved a recommendation of the Gas Committee to the effect that when the question of installing electricity in place of gas in the Council's houses next arises the matter shall, in the first instance, be remitted to the Gas Committee for consideration and report. Previously the Gas Investigations Sub-Committee had considered a statement of the clerk regarding the loss which the gas undertaking had sustained through electricity being installed in houses on the Viewpark Estate in place of gas, the clerk pointing out that if the change-over was extended to other estates the undertaking would lose about £9,000 per annum.

Lancashire.—COUNCIL OPPOSES COMPANY'S PLANS.—Objection has been raised by the West Lancashire Rural District Council to the Lancashire Electric Power Company's proposal to use overhead lines in certain roads in providing a supply of electricity at Banks.

Lincolnshire.—FURTHER RURAL DEVELOPMENT.—Last week we gave details of a number of rural extensions in the neighbourhood of Boston. A further large electrification scheme of this nature is to be carried out in the Market Rasen and Brigg districts during the coming year by the North Lincolnshire & Howdenshire Electricity Co., Ltd., which is also preparing preliminary plans for supplying North and South Kelsey, Holton-le-Moor and Osgodby. Good progress is being made at Atterby, Snitterby, Waddingham and Bishop Norton, and Tealby will be included next year. Wayleave difficulties are hampering work at Middle Rasen, Nettleton and Waddingham. The company intends to erect a line from Barnetby to Caistor, and is also considering the provision of a supply to Bigby, Somerby, Searby and Grasby.

Liverpool.—RECOVERING PAYMENT.—Powers are being sought by the Corporation in respect of the recovery of sums due for electricity and fittings. One clause provides that the placing in a coin box of anything other than the appropriate current coin, shall be deemed, in its application to the electricity undertaking, to be fraudulent. No proceedings will be taken if, within seven days after demand, payment is made to the Corporation. It is proposed to extend the powers conferred on the Corporation by Section 24 of the Electric Lighting Act of 1822 regarding entry into premises. If a person refuses to admit an officer to premises which he is entitled to enter, the Corporation will have the right to prosecute.

London.—LEWISHAM.—A recommendation of the Works Committee that Canadian Avenue should be lighted by 250-W "Osira" electric-discharge lamps was debated for more than an hour at a recent meeting of the Borough Council. The tender was £7 11s. per standard per annum, as compared with £10 6s. in the case of centrally suspended gas lighting, and the chairman of the Committee stated that it had chosen what it considered to be the better lighting. A protagonist of the claims of gas, however, declaring somewhat cryptically that "the same old gang" was at work, contended that the gas company had not been asked to tender for lighting comparable with the electrical system. He moved that the recommendation should be referred back. Twenty members voted in favour of this course and the same number against, the Mayor giving his casting vote in favour of reference back. In view of this decision, the chairman of the Works Committee intimated that he would take back a further recommendation for "Osira" lighting in Springfield Crescent.

BATTERSEA.—The Borough Council is applying for sanction to an expenditure of £7,038 on machinery and plant. Electricity services are to be provided to 163 premises at an estimated cost of £1,261, and a new cable is to be laid in place of the existing vulcanised bitumen distributor in Queen's Circus.

Okehampton.—SUPPLY TO NORTHLEW.—The West Devon Electric Light Co., Ltd,, has informed the Rural District Council of its intention to give a supply of electricity to Northlew.

Palestine.—MODERN LIGHTING AT BETHLEHEM.—The Jerusalem Electric and Public Service Corporation supplies Bethlehem and a number of the neighbouring villages with electricity, which is used for public lighting. Care has been taken that the standards should be in keeping with the surroundings. The accompanying photograph shows an artistic lighting column outside the Church of the Nativity, the star at the top being illuminated when the lamps are switched on.

An electric lighting standard at Bethlehem

Port Talbot.—DISTRIBUTION EXTENSIONS.—Negotiations for a bulk supply of electricity to Port Talbot are nearing completion, and the Council has under consideration the extension of the system throughout the district with tariffs that will compare favourably with any part of the country. This year the lighting flat rate has been reduced from 8d. to 5d. per kWh.

Russia.—ELECTRIC POWER OUTPUT.—In 1933, the first year of the Second Five-Year Plan, 16,366,000,000 kWh of electric power was generated in the U.S.S.R. In 1934 the production amounted to 20,500,000,000 kWh; this year an output of 25,000,000,000 kWh is anticipated, states *Reuter's Trade Service* from Moscow.

South Africa.—BETHLEHEM DECIDES ON ITS OWN SCHEME.—The ratepayers of Bethlehem, Orange Free State, have rejected the proposal to dispose of the town's power station and equipment to the Electricity Supply Commission, and they have authorised the Town Council to proceed with a scheme for extending the plant and for replacing the d.c. system by a.c. The scheme is estimated to cost £43,000.

AN ADDITIONAL SUPPLY FOR JOHANNESBURG.—The Johannesburg City Council has decided, by the casting vote of the Mayor, to accept the offer of the Victoria Falls & Transvaal Power Co., Ltd., for an additional supply of electricity, particularly during peak load periods. The strong opposition arose in view of the fact that several members declared that the proposal was part of a plan to hand over the municipal power enterprise to the V.F.P. Company.

Glossop Road Baths Dance Hall, Sheffield, illuminated by "Osram" lamps. There are 100 sets of decorative lamps as well as a number of coloured types and sixteen 500-W lamps in the special bowl fittings

Southend-on-Sea.—MILITARY ELECTRICITY SUPPLIES.—The Town Council has entered into an agreement whereby it is to give a bulk supply of electricity to the War Department.

Spalding.—MAINS EXTENSIONS.—The mains supply is to be extended to the Land Settlement Association's estate at Low Fulney. A supply is also to be given to Weston, for which a loan of £1,250 is required.

ELECTRIC COUNCIL HOUSE LIGHTING.—The Urban District Council has decided that houses on the Winsover Road, Pennygate, estate shall be lighted by electricity.

Whitby.—PROPOSED CANVASS.—Following a request for a supply of electricity to the village of Iburndale, the Urban District Council has decided to canvass the area in order to ascertain the demand.

Wellingborough.—MARKET LIGHTING.—The Urban District Council has accepted a tender from Wellingborough Electricity Supply Co., Ltd., for lighting the market.

Wimbledon.—PROGRESS MAINTAINED.—The chief electrical engineer and manager, Mr. A. E. McKenzie, reports that the Electricity Department has again had a very successful year. The bulk of the electricity sold in the area is utilised for domestic purposes and a very low tariff has been introduced, with the result that 18.3 per cent. of the premises in the Department's area have electric cookers and 18.65 per cent. have water-heaters. A supply is given to 99.4 per cent. of the buildings in the area, and during the year 2,923 new consumers were connected, making the total 33,791. The engineer points out that the undertaking is the largest ratepayer in the district, having paid £18,536 in 1934-35, an increase of 64 per cent. over the previous year.

Winchester.—PREFERENTIAL CHARGES DISCONTINUED.—In accordance with a resolution passed by the Council, the Electricity Committee has decided to terminate the granting of preferential charges for energy supplied to the officials and staff of the undertaking.

Yorks.—"NO GAS" DECISION.—The City Council has approved a recommendation of the Housing Committee that the Gas Company should not be allowed to install pipes in the houses which are to be erected on the Waters Lane estate, and which are to be provided with electrical installations. It was stated that the Committee had a settled policy on the subject of the installation of electricity and gas in Corporation property.

Storage Heating in France

IN France, especially outside the water-power zones, some electricity supply authorities have feared the effect of the luminous type of electric radiator (except those of small capacities) for general heating on the ground that their utilisation during peak hours made the load of doubtful economic value. A certain number of undertakings, however, have four tariffs, covering peak and other hours for lighting and small accessories, peak hours, off-peak day hours, and night uses.

An attractive 4-kW storage heater

This situation has encouraged the development of ranges of heaters which operate primarily by air conduction; in France the open fire has never had the same attractions as it has for us, and there is not the same objection to a heating appliance which shows no glow and which can be boxed in. Several makes of heaters for semi-storage and full storage have been developed.

The semi-storage type of heater is employed where the electricity authority offers day energy for heat at a low rate outside the peak hours; this system is useful where the heating is to a material extent discontinuous.

Heaters of the full storage type are in favour where a low price is quoted for night service. The principle adopted in both cases is to heat up cast-iron blocks or other heat-absorbing substances by means of resistance grids packed in sandwich form in a heat-insulated box-shaped casing with a metal framework, the sides being filled in with decorated asbestos cement sheets or other analogous material. Air ducts from below lead to louvres.

When the heater is being charged the air outlet at the top is closed and the heat is kept in by the bell effect and the insulated walls. When charged, the heat is let out as required by means of air circulation through the ducts and regulating shutter. One make has a thermostatic shutter regulator, which keeps the temperature of the room reasonably constant. Switching is usually performed by a time clock, but a high-frequency system for the operation of special relays is being developed in some areas.

When storage heaters were first made, trouble was often experienced due to failure of the element at temperatures which the best alloys will withstand nowadays. Further troubles arose owing to breakage of the heater conductor following expansion and contraction as a result of the methods used for building up the elements.

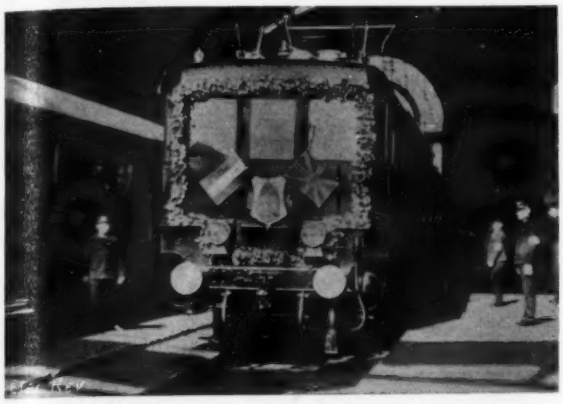
Improvements in the internal design of such heaters include a series-parallel arrangement of the elements, special conductor forms and insulation, more suitable air ducting, and better heat insulation for the walls. Some of the latest heaters with a hammered-iron decorated framework have a good appearance. These storage heaters are having some vogue not merely for domestic uses, but also for offices and schools as they do not scorch the air.

Box-shaped heaters covered with "Everite" asbestos sheets coloured and polished to look like marble are extremely neat. In order to store enough heat the larger sizes are heavy, but they are usually placed along a wall or in front of a fireplace.

In France there are bakers' and confectioners' electric ovens that work to a greater or lesser extent with stored heat: in some of them ordinary sand is used as the storage element. For baking, fuel oil has a vogue, but some authorities have recently stated that its use can be deleterious to the bread. As the weight to be baked in proportion to the cost is greater, heat storage for bread baking is more attractive than for confectionery, although the hours of baking in some cases fit in with those of supplies of electricity at a low tariff. In the South hot-water storage is being adopted for a certain number of office buildings.

Traction

Denmark.—GRANT FOR ELECTRIFICATION.—The Director-General of the Danish State Railroads has applied to the Government for a grant of Kr.5,400,000 (about £246,000) to cover the cost of electrifying the suburban line from Copenhagen to Ballerup. The locomotives for the Copenhagen to Klampenborg and Hellerup to Frederiksberg electric suburban services were supplied by British manufacturers, and our Copenhagen correspondent states that British industry may find another opening when the electrification of the Copenhagen to Ballerup line is carried out. The locomotives on



This photograph, sent us by the Metropolitan-Vickers Co., shows the locomotive which hauled the special train on the occasion of the festival of inauguration of Hungarian electrified lines, decorated with the flags of Great Britain and Hungary

the new route will be trolley-fed from overhead lines, but this is probably the last time that such a system will be employed, for while the Director-General gives preference to electric traction at the cost of steam he favours the Diesel-electric type of train, which has been developed by Danish manufacturers.

France.—STAINLESS-STEEL TRAINS.—Twentythree-car trains of stainless steel, built-up on the Budd welding process, have been ordered by the French State Railways for fast suburban service between Paris and Rambouillet, a section of the main line from Paris to Le Mans, which is now being converted to electric traction.

NEW ELECTRIFIED LINE.—The 125 mile long Montauban to Narbonne main line of the Paris-Orleans Midi Railway, has just been opened to electric traction. Conversion work on the heavily-graded Montauban to Brive line is proceeding, and when completed towards the end of 1936, main line trains will be hauled electrically from Paris to Narbonne, a distance of 540 miles. Fifteen heavy traffic motor coaches have been built for service between Paris and Orleans (78 miles).

French Congo.—DIESEL-ELECTRIC LOCOMOTIVES.—The Société des Forges et Acieries de la Marine et d'Homecourt (France) has recently completed three Diesel-electric locomotives for the French-Congo Ocean Railway. The engines are of the six-cylinder type developing 690 h.p. at 700 r.p.m.

Great Britain.—LANDSLIDE DISPLACES CABLE.—According to the daily Press, a minor landslide occurred on the Southern Railway's main Brighton line near Haywards Heath on Monday, the 11 kV power cable being pushed close to the line. The cable did not break, and when the traffic had ceased the earth was removed and the cable placed back in position.

Grimsby.—PROPOSED TROLLEY-BUS SERVICES.—The Corporation proposes to seek power to run trolley-vehicles on two routes.

Huddersfield.—TROLLEY-BUSES.—The Corporation has applied for an Order authorising the abandonment of certain tramway routes and the substitution of trolley-bus services.

Italy.—HIGH-SPEED VEHICLES.—In addition to the six three-car articulated trains now being built for fast services on the 3,000-V d.c. lines between Florence, Rome, and Naples, a number of 800-h.p. single-unit streamlined motor-coaches have been ordered by the Italian State Railways for solo operation at speeds up to 75 m.p.h.

Llanelly.—EXTENSION OF TROLLEY-BUS SERVICE.—The Llanelly and District Electric Supply Co., Ltd., has informed the Town Council of its intention to promote a Parliamentary Bill to extend the trolley-bus service a distance of three miles along Pwll Road from Loughor Bridge to Burry Port.

New Zealand.—FURTHER ELECTRIFICATION.—At a cost af about £90,000, the New Zealand Government Railways is to electrify the suburban line from Wellington to Johnsonville, which formed part of the main line until the construction of the Tawa flat deviation. The service is to be worked by multiple-unit trains.

Reading.—NEW TRANSPORT PROPOSALS APPROVED.—The Corporation's proposal to run trolley-buses has been approved by the Berkshire County Council.

Russia.—ELECTRIFICATION OF RAILWAYS.—The line from Zaporozhye to Dolgintsevo, on the Ekaterinsk Railway, has been electrified and opened for traffic, learns *Reuter's Trade Service* from Moscow. The route is 200 km (125 miles) long, and on it goods trains of 2,000 tons are running at a speed of 50 k.m. (32 miles) an hour, and mail trains at 65 k.m. (41 miles) an hour. The new 122-mile electrified line in the Urals from Sverdlovsk to Goroblagodatskaya is to be opened shortly.

Swansea.—TRANSPORT CONTROVERSY.—Another attempt is being made by the South Wales Transport Co., Ltd., to obtain authority to substitute bus services for the tramway system in the town. The Council successfully opposed a previous Parliamentary Bill, one of the grounds of complaint being loss of revenue to the electricity undertaking. Efforts are now being made by the Council to reach an agreement with the company, and it is understood that trolley-buses have been suggested.

Switzerland.—RAILWAY IMPROVEMENT PLANS.—Next year the Swiss Federal Railways is to electrify the lines from Giubiasco to Locarno and from Gossau to Sulgen. Four more high-speed electric motor-coaches are to be built for fast inter-urban traffic.

Tilbury.—SUGGESTED ELECTRIFICATION.—A deputation from the Urban District Council recently interviewed officials of the L.M.S. Railway Co., regarding the improvement of transport facilities, one of the subjects discussed being the electrification of the Ockendon line.

United States.—HIGH-SPEED SERVICES.—Prior to being put into daily service between St. Louis and Burlington a light Diesel-electric train was tested for five days and, according to the *Railway Gazette*, it was claimed to have reached a speed of 122 m.p.h. on a down gradient varying between 1 in 1,000 and 1 in 330. A distance of 53.3 miles was covered in 39 min., giving an average speed of 82 m.p.h.

Communications

Australia.—MORE TELEPHONES IN NEW SOUTH WALES.—Mr. J. S. Duncan, Deputy Director of Posts and Telegraphs in New South Wales, recently stated that at the end of September there were 206,069 telephones in use in the State. Of these, 126,308 were within a radius of fifteen miles of Sydney General Post Office. He added that there had been a largely increased demand for new installations, 1,507 having been provided in September.

NEW BROADCASTING STATIONS.—The Commonwealth Postmaster's General's Department is planning to construct new broadcasting stations to replace two existing stations at Melbourne, two at Sydney, one at Brisbane, and one at Hobart. Substantial improvements have been made already to stations at Perth and Adelaide. The completion of the new 3LO station at Melbourne will be followed by the abandonment of the agreement between the Postal Department and Amalgamated Wireless (A/sia), Ltd., whereby Amalgamated Wireless provides the technical facilities for the 3LO service. The existing station at Braybrook is owned by Amalgamated Wireless and operated under subsidy.

France.—PUBLIC TELEVISION IN FRANCE.—M. Mandel, the Minister of Posts and Telegraphs, opened the first public television broadcasting station in Paris last Sunday. Broadcasting will be on a wavelength of seven metres, with a 180-line screen. The studio itself is in the Rue de Grenelle, and the transmitting apparatus is at the top of the Eiffel Tower. The full range of the transmitter is not yet known, but it will easily include the whole of greater Paris. As only a few amateurs possess television receivers, M. Mandel has decided to install public receivers at various points in the capital, and regular broadcasting will begin before the end of the month. —*The Times.*

TESTS FROM TOULOUSE.—According to *World Radio*, tests are being made by the Toulouse-Muret transmitter after 11 p.m. with a power of 60 kW. Later 120 kW will be used, while the installation provides for an ultimate power of 200 kW.

Russia.—LONG-DISTANCE TELEGRAPHIC COMMUNICATION.—Direct telegraphic communication has recently been established between Moscow and Vladivostock, a distance of about 5,940 miles.

Siam.—AUTOMATIC TELEPHONE EQUIPMENT.—With a view to modernising the telephone service of Bangkok, the Siamese Royal Posts and Telegraphs Department recently conducted an exhaustive survey of modern practice in automatic telephony. As a result, an order has been placed with the General Electric Co., Ltd., for the supply and installation of the first automatic equipment for public service in Siam. Bangkok is to be served by two such exchanges—Wat Lieb and Bangrak—which are being equipped for 2,300 and 1,200 subscribers, respectively. Provision is to be made at each exchange for an ultimate total of 10,000 lines, together with facilities for direct access to subsequent exchanges. The equipment will be of the British Post Office standard "Strowger" type, and will have full tropical finish. The trunking arrangements provide for a five-digit numbering scheme to give automatic intercommunication between all subscribers at this first stage, and to maintain the facility at all future stages in the development of the area.

Contract Information

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses

Contracts Open

Abertillery.—U.D.C. L.p: cable, pole mounting, cable boxes, joints, cable guards, etc., for connecting up outgoing feed from two static sub-stations. Engineer, 40, Somerset Street.

Australia.—MELBOURNE.—January 13th. Electric Supply Committee. 6,600-V and 22,000-V switchgear for the Waratah Place sub-station. (T.Y. 10214/5.)*

January 13th. State Electricity Commission of Victoria. Two compound-filled feeder circuit-breaker units. (T.Y. 10209.)*

January 15th. Victoria Railways Commission. R.i. taped and braided copper conductors. (T.Y. 10212.)*

SYDNEY.—December 9th. Electricity Department. 33,000-V and 11,000-V metal-clad switchgear for the Camperdown sub-station. (T.Y. 10183.)*

Barking.—December 3rd. Electricity Department. L.p., p.i. cables. (November 15th.)

Birmingham.—November 27th. Electric Supply Department. Stoneware conduits for electric cables. (November 8th.)

Brighton.—December 9th. Electricity Department. Oil immersed three-phase reactor. (See this issue.)

Colwyn Bay.—November 23rd. Electricity Department. H.p. and l.p. switchgear. (November 1st.)

Dumfries.—November 29th. Electricity Department. Transformer kiosk. (See this issue.)

Egypt.—CAIRO.—December 18th. Ministry of Public Works. One Diesel-driven 5-kW d.c. generating set, complete with switchboard, &c., for the Nubian floating workshop. (T.Y. 10210.)*

December 23rd. Electrically driven lathe and slotting machine for Atf power station. (T.Y. 5464.)*

Fleetwood.—Electricity Department. Two 10/12 cwt. electric vans. (November 15th.)

Haddington.—November 30th. Electrical work and additions to Vent Memorial Hospital. J. Douglas Miller, architect, 5, Forres Street, Edinburgh (deposit £2 2s.).

Hawarden.—November 28th. R.D.C. Electric motor control panel and alteration to compressor at sewerage works. (See this issue.)

Hendon.—November 25th. Town Council. Filtration plant, chemical apparatus, piping, valves, direct-coupled motors and pumps, and electrical equipment, control gear and wiring, &c., at the open-air swimming pool, West Hendon. A. O. Knight, borough engineer, Town Hall (deposit £2 2s.).

Heston and Isleworth.—December 9th. Electricity Department. E.h.p. cables, transformers and switchgear. (See this issue.)

Hoylake.—November 23rd. Water Department. Diesel-driven alternator. Water engineer, Town Hall.

India.—Bombay, Baroda and Central India Railway Co. December 6th. Lamps. (See this issue.)

Iran.—Ministry of Posts, Telegraphs and Telephones. Lamps for the central "Pahlévi" wireless station, Teheran. Commercial Attaché to the Imperial Iranian Legation, Ling House, 10-13, South Street, London, E.C.2.

Irish Free State.—DUBLIN.—December 31st. Electricity Supply Board. P.i. cables; 40-kV underground power cables and jointing accessories in Dublin. (See this issue.)

Kettering.—November 29th. Electricity Department. Two transformers and one e.h.p. switchboard. (November 15th.)

Kincardine.—November 25th. County Council. Various works, including electrical, at a new school at Inverbervie. D. & J. R. McMillan, architects, 105, Crown Street, Aberdeen.

Leicester.—Electric lifts for the new municipal offices, Charles Street. Barnish & Silcock, architects, 588, Rodney Street, Liverpool.

London.—CENTRAL ELECTRICITY BOARD.—December 9th. 66-kV overhead transmission lines for the North-West England and North Wales Electricity Scheme. (November 1st.)

Louth.—November 26th. Electricity Department. L.p., p.i. cables. (November 15th.)

Manchester.—November 29th. Electricity Department. Three-phase, 4-wire, 400/230-V a.c. switchgear. (November 8th.)

New Zealand.—WELLINGTON.—December 17th. Public Works Department. Three 150-kVA oil-immersed transformers. (T.Y. 10197.)*

Oldham.—December 2nd. Electricity Committee. Earthenware conduit. (See this issue.)

Penicuik.—November 30th. Town Council. Electric lighting at forty-four houses. Morham & Brotchie, surveyors, 29, Hanover Street, Edinburgh.

Plymouth.—December 7th. Corporation. 33,000-V switchgear, 33,000/6,600-V transformers, and auxiliary apparatus. (November 8th.)

Portsmouth.—Electricity Department. E.h.p. cables (underwater and underground) between the generating station, Portsmouth, and Gosport. (November 15th.)

December 2nd. Corporation. P.i. and v.i.r. cable. (See this issue.)

Rothesay.—November 28th. Electricity Department. 500-kW Diesel oil engine generating set. (November 8th.)

Southampton.—November 26th. Electricity Department. Storage battery with metal rectifier chargers, control panel, &c. (November 15th.)

Stanley (DURHAM).—December 12th. Electricity Department. Meters, lamps, cables, wiring supplies. (See this issue.)

Sunderland.—November 26th. Town Council. Two electric bed lifts for the Municipal Hospital. Borough engineer, Town Hall (deposit £2 2s.).

Wembley.—November 30th. U.D.C. Carcase wiring for ninety-six cottages on the Manor Farm housing estate. November 8th.)

West Ham.—November 25th. Electricity Department. Paper-insulated cables and coal. (November 1st.)

West Riding.—November 25th. County Council. L.p. hot water apparatus and electric lighting in the following schools: Goole New Senior C., Knaresborough C., Ryhill and South Hiendley New Senior C., and Stainforth New Senior C. Education officer, County Hall, Wakefield.

* Further particulars from the Department of Overseas Trade (Inquiry Room), 36, Old Queen Street, London, S.W.1.

Contracts Closed

Darlington.—Town Council. Accepted. Sub-station equipment.—A. Reyrolle & Co., Ltd.

Glasgow.—Electricity Committee. Accepted. Transformers: Six 200-kVA.—Metropolitan-Vickers Electrical Co., Ltd. Four 400-kVA.—British Electric Transformer Co., Ltd. Eight 400-kVA.—Bruce Peebles Co., Ltd. Two 800-kVA.—Brush Electrical Engineering Co. Two 800-kVA.—Johnson & Phillips, Ltd. Two 800-kVA.—British Thomson-Houston Co., Ltd.

Housing Committee. Accepted. Electrical installations: 374 houses and seven shops at Blackhill extension No. 2 (£1,604).—A. A. Moore; 123 houses at Dunsmuir Street (£548).—Darroch & Espie; twenty houses and eight shops at Garugad Road (£134).—R. J. Sinclair (Glasgow), Ltd.

India.—Stores Department. Accepted. Electrical centrifugal pumping plant (Rs.964), two sets of electrically driven pumping plants (Rs.2,298) and twelve electric motors (Rs.4,984).—Mather & Platt, Ltd. Spares and accessories for electrical signalling purposes (Rs.13,411).—General Electric Co. (India), Ltd.

London.—ISLINGTON.—Housing Committee. Recommended. Electrical installation at Council dwellings (£311).—A. G. Newton. This was one of five tenders, the highest being £430.

L.C.C. Public Assistance Committee. Accepted. Electrical installation in home for aged men, Cedars Road, Clapham (£670).—Twentyman & Willmott, Ltd.

Accepted. Wiring and fittings for electric lighting of cottages to be erected at Becontree (£155).—Holliday, Hall & Stimson, Ltd. This was the lowest of eleven tenders, the highest being £287. Electrical fittings.—Falk, Stadelmann & Co., Ltd.; Ferguson Battery Co., Ltd.; Hellesens, Ltd.; Julius Sax & Co., Ltd.; Sperrryn & Co.; J. H. Tucker & Co., Ltd.; Wm. White & Co., Ltd.; Wandsworth Electrical Manufacturing Co., Ltd.

Northumberland.—County Council. Accepted. Electrical installations in connection with the new Northgate Mental Hospital (£4,890).—Devereux, Moodie & Co., Ltd.

Portsmouth.—Corporation. Accepted. Seventy-six all-metal double-deck trolley-buses.—Cravens Railway Carriage & Wagon Co., Ltd.

Richmond (SURREY).—Town Council. Accepted. Traffic signals at the junction of Church Road and Sheen Road (£534).—Automatic Electric Co., Ltd.

Forthcoming Events

INSTITUTION OF ELECTRICAL ENGINEERS.—Monday, November 25th. Institution, London. 7 p.m. Informal meeting. Discussion on "Light Current Applications in Heavy Engineering." To be opened by Mr. N. C. Smart.

Mersey & North Wales (Liverpool) Centre.—Monday, November 25th. Adelphi Hotel, Liverpool. 7.30 p.m. Annual dinner. Wednesday, November 27th. The Temple, Dale Street, Liverpool. 6.30 p.m. Joint meeting with the Liverpool Engineering Society. "Electric Boilers." Mr. L. C. Grant.

North-Eastern Centre.—Monday, November 25th. Armstrong College, Newcastle-upon-Tyne. 7 p.m. "Standardisation of Impulse-Voltage Testing." Messrs. T. E. Allibone and F. R. Perry.

North Midland Centre.—Tuesday, November 26th. Hotel Metropole, Leeds. 7 p.m. Paper by Messrs. T. E. Allibone and F. R. Perry.

Scottish Centre.—Tuesday, November 26th. Grosvenor Restaurant, Glasgow. 6.30 for 7 p.m. Annual dinner.

Wireless Section.—Tuesday, November 26th. Institution, London. 6.30 p.m. Informal meeting. Discussion on "Standardising Performance of Broadcast Radio Receivers." To be opened by Mr. R. L. Smith-Rose.

West Wales (Swansea) Sub-Centre.—Thursday, November 28th. Central Hotel, Swansea. 6.30 p.m. "The Grid and the Industrial Load." Mr. H. Manley Roberts.

South Midland Centre.—Friday, November 29th. Grand Hotel, Birmingham. 7 p.m. Annual dinner.

Birmingham Electric Club.—Monday, November 25th. Imperial Hotel, Birmingham. 7 p.m. Discussion on "Recruiting for Industry—Training, Conditions and Prospects."

Junior Institution of Engineers.—Monday, November 25th. Manchester. "Electric Welding." Mr. O. J. Hughes.

Electrical Industries Benevolent Association.—Tuesday, November 26th. Grosvenor House, W.1. 8.30 p.m. Annual ball.

Hotel Restaurant and Catering Exhibition.—Friday, November 29th, to Friday, December 6th. National Hall, Olympia, S.W.

Notes

Consulting Engineers' Silver Jubilee

The annual dinner of the Association of Consulting Engineers held at St. Stephen's Club, S.W., on November 15th, marked the twenty-fifth year of it slife. The chairman, Sir Cyril Kirkpatrick, presided over a gathering of about 200. The first toast, that of "Engineering and Our Empire," was proposed by Lord Lloyd, who commended the work of engineers throughout the Empire, especially in India and Egypt of which he had special knowledge. He believed that there would never again be a famine in Western India provided their works were maintained. Responding, Mr. J. D. Watson (Pres. Inst. C.E.) referred to the beneficial effects of the construction of reservoirs on the health and life generally of the people, and also to the advantages to them of radio, and of electricity produced from water power. Proposing the health of "Our Legal Friends," Mr. S. C. Lewis (hon. treas.) claimed that it was now the engineer who brought "the greatest benefit to the greatest number." Mr. F. J. Wrottesley, K.C., and Mr. A. J. Lees (hon. solicitor) responded. "The Association of Consulting Engineers" was proposed by Sir Clement Hindley, who recalled its formation and referred especially to the work carried out on its behalf by Mr. A. H. Dykes, one of the signatories to the original memorandum and subsequently hon. secretary.

Institute of Physics (Midland Section)

The second local section of the Institute of Physics to be formed in this country was inaugurated at a meeting held at the University of Birmingham on November 15th. Over 150 persons were present, many having come specially to Birmingham from other towns in the Midlands. Prof. S. W. J. Smith was elected chairman and Dr. J. H. Mitchell, of the British Thomson-Houston Research Laboratory, local honorary secretary. The inaugural lecture was given by Dr. J. D. Cockcroft, of the Cavendish Laboratory, Cambridge, who took as his subject "Recent Work on Nuclear Transmutations." The laboratories of the Physics Department of the University were inspected during the evening. It is proposed to hold the meetings of this new section in Rugby and Leicester and possibly other towns in the Midlands during the session.

Defects of Amplifiers

At a meeting of the Institute of Physics in London on November 12th an informal discussion took place on the defects encountered in amplifiers. The opening speakers were Mr. E. B. Moullin, of the Engineering Laboratory, Oxford, who dealt with "Background Noise, including the Shot Effect"; Mr. G. S. Lucas, of the British Thomson-Houston Co., Ltd., on "Limitations due to Valve Characteristics"; and Mr. A. Whitaker, of Electric and Musical Industries, on "Defects of Circuits in Relation to Frequency Response." The general discussion which followed was summed up by Mr. R. A. Watson Watt, of the Radio Research Board.

Supervisors' Discussion Prizes

To encourage members of the Association of Supervising Electrical Engineers to acquire a lucid style in contributing to the discussions at meetings cash prizes (introduced by Mr. S. B. Donkin, past-president) are again being awarded. Two (£5 first and £2 10s. second) are offered to members and associate members and one (£2 10s.) to associates; these may be augmented.

Chemical Engineering

The sixteenth annual volume of the Chemical Engineering Group of the Society of Chemical Industry includes the report of the general committee for 1934 and the text of thirteen papers presented at meetings of the Group, with a record of the discussions. Plastics as engineering material, air-conditioning, and a lecture by Lord Rutherford on "Trends in Modern Physics" are among the subjects dealt with.

Electrical Engineers' Ball

The Electrical Engineers' Ball for 1936 will be held at Grosvenor House, Park Lane, W., on Friday, February 14th, the day after the annual dinner of the Institution of Electrical Engineers. Tickets (one guinea each) will be obtainable from members of the General Committee.

Automotive Electrical Engineers

It has been decided to form a branch of the Society of Automotive Electrical Engineers at Swindon. The society, which was formed in 1932, already has branches in London, Manchester, Sheffield and Leeds, while others are proposed at Newcastle and Hull.

Electricity in Rural Areas

Malton (Yorks) R.D.C. has asked the Rural District Councils' Association to urge the Government to introduce legislation authorising the fixing of nominal assessments respecting electrical distribution lines where the services are not likely to prove remunerative, and for financial assistance to be provided by the National Exchequer or County Councils to assist in the provision of such supplies.

Electricity and Coal

The fuel problem is discussed in No. 60 of the broadsheets issued by P.E.P. (People's Economic Planning). The view is expressed that mining has a future, in the indirect use of coal through electricity, gas and home-produced fuel. A decline in the consumption of raw coal for domestic purposes seems inevitable, but the increase in the number of separate houses should increase the consumption in one form or another. Between 1921 and 1933 electricity generated increased by 190 per cent., but only 44.7 per cent. more coal was used. In 1934 the tonnage required was 11.7 million (nearly as much as that used by the railways), as against 4.9 million in 1913, during which period the amount used in gas-works remained almost stationary at under 17 million tons, although the quantity of gas produced by authorised undertakings increased by 36 per cent.

Nearly 70 per cent. of the total production costs of the coal industry is allocated to wages, and economies must be looked for in grading and cleaning. The average cost of production in 1928 was 14s. 2¼d. per ton, and in 1934 it was 12s. 11¼d.; average receipts per ton increased by 1¼d. to 13s. 4½d., at which the profit was 5d. per ton. During the same period mechanisation was greatly increased and the output per man rose by nearly one-fifth to 290 tons per annum. Six years ago the proportion of the total output handled by coal-cutting machines was 26 per cent., by conveyors below ground 12 per per cent., and by coal-cleaning plant 25 per cent.; last year the equivalent figures were 47, 37, and 40 per cent. respectively.

Electric Thickness Gauge

A new electric gauge for measuring the thickness of porcelain enamel, paint, or other non-magnetic materials, such as celluloid, glass, mica, &c., which have been applied to, or laid on, flat sheets or plates of steel or iron, has been introduced by the General Electric Co. of New York. It permits quick and convenient measurement of the thickness of the material wherever a flat surface slightly more than 1 in. in diameter can be found. Weighing only 7.5 lb. complete, it can be used portably wherever a 110-V 60-cycle power supply is available.

The instrument consists of a small indicator in a cast-aluminium cabinet and a 0.5 lb. gauge head connected to the cabinet by cable. When the face of the gauge head is held in contact with the surface of the material to be measured, the thickness can be read directly on an indicating instrument mounted on the front of the cabinet. Because of its light weight, the gauge head can be moved readily to any point on the surface and the corresponding measurement conveniently taken. Operation is based upon the reluctance of a magnetic circuit passing through a coil in the gauge head and through the steel directly under the portion of the material upon which the gauge head is placed. Since the greater part of this reluctance is produced by the non-magnetic material (or equivalent air gap) the indication obtained is dependent upon the thickness of material being measured. Thickness ranges of 1 to 5, 2 to 10, 5 to 25, 10 to 50, and 20 to 100 mils can be obtained, a separate scale being required for each range.

The "Aslib" Book List

Following two experimental numbers issued to members only, the first quarterly list of recent scientific and technical books recommended to libraries has been issued by the Association of Special Libraries and Information Bureaux, 16, Russell Square, W.C.1. The list is selected by specialists who are able to assess the relative merits of new publications, and only books in English are selected. The published price of the periodical is 10s. 6d. per annum to non-members of the Association.

I.E.E. Students' Smoking Concert

A successful social evening was held last Friday at the White Horse Restaurant, High Holborn, when the annual "smoker" of the I.E.E. London Students' Section took place. Four professional turns and contributions by the members of the audience were well received. Among those present was the President, Mr. J. M. Kennedy.

Statistical Methods of Quality Control

Modern industry in Great Britain is awakening to the value of statistical analysis in the control and standardisation of quality in industrial production. A publication dealing with this matter (No. 600-1935) has been issued by the British Standards Institution. The author is Professor E. S. Pearson, of the Department of Applied Statistics, University College, London, who has had the co-operation of a committee of men engaged in practical industry. The main object of the publication is to set out as clearly as possible for the industrialist no less than for the statistician why statistical technique is needed and what kind of assistance it can give. Illustrations have been taken from the manufacture of cloth, of electric lamps, of building materials, and from the testing of coal and engineering products, &c. Many diagrams are given, also a number of specially prepared tables published for the first time to assist in calculations required in the solution of the problems discussed. Copies of the publication can be obtained on application to the British Standards Institution, 28, Victoria Street, S.W.1, price 5s. 6d. post free.

Appointments Vacant

Assistant secretary (Southern Area), for the Electrical Power Engineers' Association.

Plumber-jointer for Workington Electricity Department. (See our classified advertisements.)

Makers' Names Wanted

PROCTOR toaster.

KEEPWARM combined radiator, cooker, &c.

Our Personal Column

Electrical men are invited to keep readers of the "Electrical Review" posted concerning their movements

THE NEW PARLIAMENT.—The following gentlemen, who are associated in various ways with the electrical industry, were returned at the General Election held last week :—

Mr. G. Balfour (Hampstead) is the founder and chairman of Messrs. Balfour, Beatty & Co., Ltd., and is chairman or a director of a number of electricity supply companies.

Mr. A. E. L. Chorlton (Bury) is principally concerned with internal combustion and general engines. He is a director of the Lancashire Dynamo & Crypto, Ltd.

Mr. H. G. Williams (Croydon, South) is executive director of the Incorporated Association of Electric Power Companies. He is also on the board of Bennis Combustion, Ltd.

Sir Walter R. Preston (Cheltenham) is a director of Messrs. J. Stone & Co., Ltd.

Mr. G. Gledhill (Halifax) is on the board of Gledhill-Brook Time Recorders, Ltd.

Sir Joseph Nall (Manchester, Hulme) is a director of the Midland Counties Electric Supply Co., Ltd., and is chairman of a number of transport undertakings.

TRICAL REVIEW on this subject. He is a director of Messrs. Johnson & Phillips, Ltd., and is also on the boards of a number of electricity supply companies.

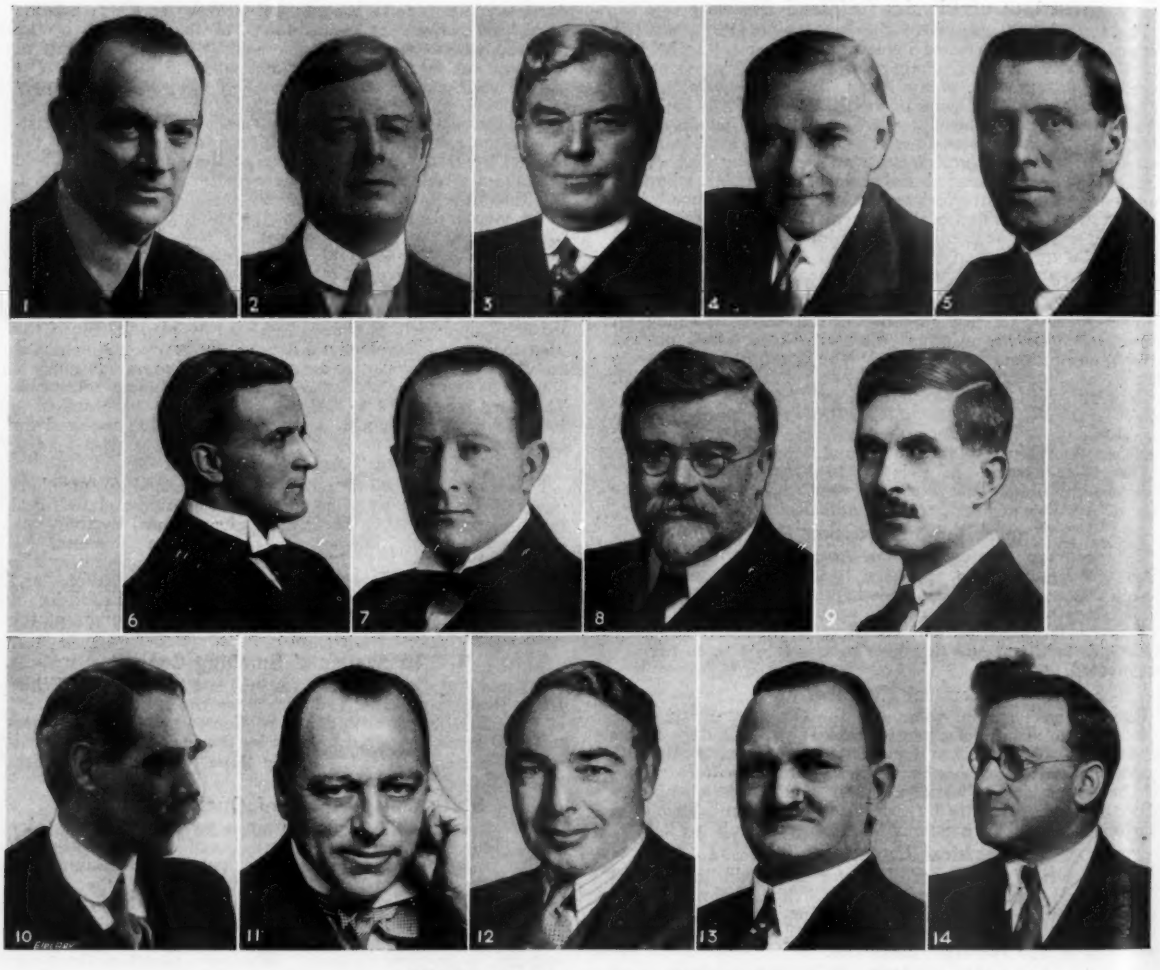
Sir Arnold B. Gridley (Stockport) is chairman of the Brentwood District Electric Co., Ltd., and a director of the Southern Areas Electric Corporation, Ltd. He was Controller of Electric Power Supply during the War.

Mr. H. Morrison (Hackney, South) is a former Minister of Transport and an ardent advocate of the re-organisation of the electricity supply industry.

Mr. L. Hore Belisha (Plymouth, Devonport) is Minister of Transport, and as such is the "Controller" of the electricity supply industry.

Sir George Hamilton (Ilford) served his apprenticeship as electrical engineer with Messrs Scott & Mountain, and afterwards represented that company in India, Egypt, Russia and other parts. He is chairman of the Expanded Metal Co., Ltd.

Mr. O. Peake (Leeds, North) is a director of the Yorkshire Electric Power Co.



Electrical Men in the New Parliament

(1) Mr. A. E. L. Chorlton. (2) Sir Philip Dawson. (3) Mr. P. J. Hannon. (4) Sir George Hamilton. (5) Sir Walter Preston. (6) Sir Arnold B. Gridley. (7) Sir Joseph Nall. (8) Sir George H. Hume. (9) Mr. J. Chuter Ede. (10) Mr. G. Balfour. (11) Mr. H. G. Williams. (12) Mr. L. Hore Belisha. (13) Sir William Ray. (14) Mr. H. Morrison. (Photos 3 to 9, 12, 13 and 15 by Elliott & Fry. Nos. 10 and 14 by Lafayette.)

Sir Brograve Beauchamp, Bt. (Walthamstow, E.) is a director of Overhead, Ltd.

Mr. J. Chuter Ede (South Shields) has been chairman of the London & Home Counties Joint Electricity Authority since December, 1934.

Sir William Ray (Richmond) is executive chairman of the British Electrical Development Association.

Mr. P. J. Hannon (Birmingham, Moseley) is a director of the Westminster Electric Supply Corporation, Ltd.

Sir George H. Hume (Greenwich), who is a member of the I.E.E., was chairman of the London Electricity Committee from 1913 to 1926, and a member of the London & Home Counties J.E.A. in 1925-26.

Sir Philip Dawson (Lewisham, West) is a well-known authority on railway electrification, and has written for the ELEC-

Mr. Arthur Ellis is one of the new Justices of the Peace for the city of Cardiff. Mr. Ellis, who is a consultant, was Cardiff's first electrical and tramways engineer.

Mr. J. J. McKichan, O.B.E., has been appointed chief engineer of the Scottish Region of the Post Office. **Mr. B. L. Barnett,** M.C., at present principal in the Telecommunications Department, is to be Telecommunications Controller. **Mr. C. A. Taylor,** M.C., at present superintending engineer of the North-Eastern Engineering district, is to be Deputy Regional Director. The appointments are in connection with the formation of the experimental Regional headquarters organisation of the Post Office.

Mr. A. H. Sheppard has retired from the boards of the Ever Ready Co. (Great Britain), Ltd., the Ever Ready Trust, and Lissen, Ltd.

Mr. A. W. Metcalf, M.Sc.Tech., A.M.I.E.E., has been appointed to the post of evening lecturer in electrical engineering at the Erith Technical College. He graduated from Manchester University in 1924 with a B.Sc.Tech. degree in electrical engineering, and ten years ago he took up the position of outdoor contracts engineer with Messrs. Callender's Cable & Construction Co., Ltd. In 1929 he was transferred to the Research Department, and shortly afterwards he published a thesis on dielectrics, which gained him the higher degree. Mr. Metcalf also holds the P.M.G.'s first-class wireless certificate.

Mr. A. W. Metcalf

Mr. W. Alderson Smith, F.C.I.S., has resigned his position as managing director and secretary of the Electrical Press, Ltd. He proposes to continue to devote his energies to the development of the electrical industry.

Councillor J. Mayo, principal of Messrs. J. Mayo & Co., Newcastle-on-Tyne, has been elected chairman of the Tynemouth Corporation Electricity Committee.

Mr. F. O. Harber, A.M.I.E.E., of Aylesbury, has been appointed electrical engineer to the Portland Urban District Council. There were 211 applicants for the position.

Mr. S. C. Kiermander, draughtsman at the Worthing Corporation electricity showrooms, and Miss E. E. Pettigrew, who has been a demonstrator at the showrooms, were married last week at Worthing Presbyterian Church.

Mr. W. Gabb-Jones, engineer-in-charge of the Quetta Electric Supply Co., Ltd., and **Mr. B. C. Lobo,** deputy superintendant-in-charge of the Quetta Telegraph Office, have been awarded the M.B.E. for services rendered in connection with the recent earthquake at Quetta.

[Howard Coster

Mr. Frank Parkinson, chairman and joint managing director of Messrs. Crompton Parkinson, Ltd.

Mr. H. Kenneth Rogers, Tren Crom, Wenallt Road, Rhiwbina, Cardiff, has been appointed representative of M. & C. Switchgear, Ltd., in the South Wales and West of England districts as from December 2nd.

On November 9th a large number of members of the staff of the South London Electric Supply Corporation, Ltd., gathered at the Empire Restaurant, Victoria, to witness a presentation to mark the retirement from the Corporation of **Mr. T. E. Pickford,** A.M.I.E.E., distribution engineer, who, after serving six years with the Exeter Electric Light Co., was the first engineer appointed by the South London Co., in 1898. Toasting Mr. Pickford's health, Mr. H. W. Sprunt, M.I.E.E., M.I.Mech.E., now commercial manager to the County of London Co., told of his twenty-seven years' association with Mr. Pickford during the period that he was general manager to the South London Co. He reviewed the early days of the industry and emphasised the difficulties of distribution with which Mr. Pickford had had to contend. The presentation, which consisted of two armchairs, a wireless set, a framed testimonial and a dressing-table set for Mrs. Pickford, was made by Mr. W. J. Allbright, A.M.I.E.E., local manager to the South London Co., who spoke of the high esteem in which Mr. Pickford was held by all who came into contact with him. Replying, Mr. Pickford thanked his colleagues for their gifts and said that his long service with the Corporation had brought him many friends.

[Elliott & Fry

Mr. T. E. Pickford

Mr. R. B. Rae, executive engineer, Scotland, eastern district, has been appointed telephone manager at Dundee, under the new regional scheme of Post Office organisation.

Mr. F. H. Johnston, meter inspector at the Guildford electricity works since 1921, has resigned owing to ill-health.

Prof. James Chadwick, of Liverpool University, has been awarded the Nobel Prize for Physics for 1935 for his work in connection with neutron particles. As assistant director of radioactive research at the Cavendish Laboratory, and Fellow of Gonville and Caius, he was associated for a number of years with Lord Rutherford, at Cambridge.

Mr. C. A. Britton, B.Eng., A.M.Inst.C.E., of Bristol, has been appointed deputy electrical engineer at Chester at a commencing salary of £590 per annum. Mr. C. E. Britton is a branch manager with the British Insulated Cables, Ltd., and is the son of Mr. S. E. Britton, the Chester city electrical engineer.

Obituary

Monsieur P. Dassenoy.—The death recently occurred at Metz, Alsace, at the age of sixty-two years, of M. Paul Dassenoy, the inventor of one of the first double-rotor induction motors. Although almost blind, M. Dassenoy had recently been engaged on the design of an asynchronous motor suitable for use in connection with brake tests of motors under load.

Mr. C. N. Robinson.—The death is announced of Mr. Charles Norman Robinson, an electrical contractor well known in electrical circles in Dublin. He commenced his career as a pupil of Mr. A. E. Porte, then chief engineer of the Electrical Engineering Co., of Ireland, and later commenced business on his own account.

Mr. C. H. Lamb.—The death occurred on November 12th, in a Dundee nursing home, of Mr. Charles H. Lamb, distribution engineer with the Dundee Corporation Electricity Department. Mr. Lamb, who was fifty-six years of age, had been in the employ of the Department for over thirty-five years, and had been distribution engineer for over thirty years. He took an active interest in the I.E.E., and was a past chairman of the Dundee Sub-Centre.

Mr. T. Stretton.—We regret to record that Mr. Theodore Stretton, who we stated here last week was making fair progress after an operation, died at a Cardiff nursing home on November 14th. He was managing director of the Concordia Electric Safety Lamp Co., Ltd. Mr. Stretton was fifty-nine years of age. After his technical education in Cardiff and London he had practical engineering experience as an apprentice at Pontypridd. He subsequently became assistant engineer to Messrs. R. W. Blackwell & Co., Ltd., London, and later was engineer-in-charge at Ringsend power station, Dublin. He was connected with early tramway and overhead transmission line contracts in South Wales.

[Whitlock

The late Mr. Theodore Stretton

In 1905 he entered into partnership with Mr. S. B. Haslam, and was for many years joint managing director of the electrical and mechanical engineering firm of Haslam & Stretton, Ltd. Mr. Stretton was a member of the I.E.E., the Inst. of Mech.E., the Institute of Mining Engineers, the Illuminating Engineering Society, and other bodies. He was president of the Association of Mining Electrical Engineers in 1925. For many years he had devoted very close attention to the development of miners' electric safety lamps, and was the principal patentee of the "Thor" lamp, being also responsible for the manufacture in this country of the Concordia high c.p. alkaline lamp. The standardisation of miners' lamp bulbs and the improvement of colliery lighting were also subjects in which he was deeply interested.

Mr. C. C. Stevens, assistant system operation superintendent of the Victoria Falls and Transvaal Power Co., Ltd., has died at Germiston after a brief illness. Mr. Stevens, who was forty-six years of age, had been in the service of the company for twenty-five years.

Mr. H. W. Clayden, consulting mechanical and electrical engineer to the General Mining and Finance Corporation, Ltd., has died at Johannesburg. Mr. Clayden, who was sixty years of age, was born at Linton, Cambridgeshire, and went to South Africa in 1902, obtaining an appointment as engineer on the Consolidated Main Reef mine. In 1914 he became consulting electrical engineer to the group, and soon afterwards his work was extended to the mechanical side.

Financial Section

New Companies. Official Returns of Capital. Debenture Charges. Reports of Electrical Companies. Dividend Announcements. Transactions in Stocks and Shares

New Companies Registered

Belgrave Works, Ltd.—Private company. Registered November 16th. Capital, £500 in £1 shares. Objects: To acquire the business carried on by W. J. Coppick at Belgrave Works, Lower Hill Street, Longton, Stoke-on-Trent, as "Belgrave Works," and to carry on the business of manufacturers of electrical porcelain, dealers in all kinds of electrical equipment, &c. The directors are: W. E. Lawley, Burnside, Birmingham Road, Wylde Green; and W. J. Coppick, Hazeldene, Station Road, Milton, Stoke-on-Trent. Registered office: Belgrave Works, Lower Hill Street, Longton, Stoke-on-Trent.

Shannons & Bishop, Ltd.—Private company. Registered November 15th. Capital, £500 in £1 shares. Objects: To carry on the business of electrical engineers, contractors, merchants, factors and wireless manufacturers, &c. The directors are: F. G. Shannons, 74, Baring Road, Lee, S.E.13; and W. Bishop, 23, Renmuir Street, S.W.17. Registered office: 6, Great Chapel Street, W.1.

McLeod & McLeod (1935), Ltd.—Private company. Registered November 15th. Capital, £3,000 in £1 shares. Objects: To carry on the business of manufacturers and repairers of and dealers in dynamos, motors, armatures, magnetos, batteries, stoves, cookers, electrical, gas and oil lamps, &c. The subscribers are: F. P. Muirend and Mrs. W. Price, both of Russell Road, Moor Park, Herts. F. Price is permanent director and chairman. Registered office: 329, High Holborn, W.C.1.

McKeown & Martin, Ltd.—Private company. Registered in Belfast on November 12th. Capital, £4,000 in £1 shares. Objects: To carry on the business of electrical engineers, &c. The subscribers are: R. Smart, jnr., 38, Downshire Road, Belfast; and D. Andrew Boyd, Mahee Island, Co. Down. R. Smart, jnr., is first director. Secretary: D. A. Boyd. Registered office: 3, Bridge Street, Belfast.

Microphone & Loudspeaker Installation Co., Ltd.—Private company. Registered November 16th. Capital, £4,000 in £1 shares (3,000 ordinary and 1,000 preference). Objects: To acquire the business carried on by W. L. Overend at 7, Ely Place, E.C.1, and to carry on the business of electrical and general engineers for the purpose of installing microphones and loud speakers, &c. The permanent directors are: W. L. Overend, St. Patricks, Meadow Way, Farnborough Park, Kent; and W. Mitchell, 85, Luton Road, Dunstable, Beds. Secretary: E. R. Grundy. Solicitors: H. J. Lewis & Co., 59/60, Chancery Lane, W.C.2.

Clark & Graham (Electricians), Ltd.—Private company. Registered November 16th. Capital, £1,000 in £1 shares. Objects: To acquire the business of electrical and wireless engineers, &c., carried on by A. H. Clark and J. H. Graham at 73, Prospect Street, Hull, as "Clark & Graham." The life directors are: A. H. Clark, "Garfield," West Ella Road, Kirk Ella; and J. H. Graham, "Elgin," Cottingham Road, Hull. Secretary: John H. Graham.

Harold's Radio, Ltd.—Private company. Registered November 14th. Capital, £500 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in wireless apparatus and machines, musical instruments, gramophones, &c. The directors are: T. H. Stedman and T. H. Stedman, jnr., both of 7, London Street, Greenwich, S.E.10. Registered office: 7, London Street, Greenwich, S.E.10.

A. F. Merriott, Ltd.—Private company. Registered November 11th. Capital, £1,000 in £1 shares. Objects: To carry on the business of manufacturers of, agents for and dealers in wireless and television sets, accessories and apparatus, artificial lighting apparatus, electrical fittings, &c. The directors are: A. F. Merriott and Mrs. Kathleen F. Merriott, both of 372, Gloucester Road, Horfield, Bristol, 7.

Heat, Light & Sound, Ltd.—Private company. Registered November 11th. Capital, £500 in £1 shares (10 ordinary and 490 10 per cent. cumulative preference). Objects: To acquire the business of the 20th Century Electrical Co. carried on by G. A. Holdsworth & Euphemia M. Gurvitch at 176, Chapel Street, Salford, Lancs. The directors are: G. A. Holdsworth, 164, Errwood Road, Levenshulme, Manchester, and E. M. Gurvitch, 180, Lower Broughton Road, Salford. Registered office: 176, Chapel Street, Salford.

Ive & Murdoch, Ltd.—Private company. Registered November 11th. Capital, £1,000 in £1 shares. Objects: To acquire the business of electricians and dealers in electrical and radio supplies carried on by L. J. Ive, Ltd., at a branch at Littlestone, Kent, together with all or any of the assets employed in the business of that branch. The first directors are: L. J. Ive, 15, Albert Road, Watford, electrical engineer, and P. N. Murdoch, Glenmatuir, Brook Crescent, West Hagley, Worcs (both permanent managing directors). Secretary: Basil A. Smith. Registered office: 6/7, Queen Street, E.C.

Economic Equipment Co., Ltd.—Private company. Registered November 13th. Capital, £500 in £1 shares. Objects: To carry on the business of electricians and electrical engineers, railway, mechanical constructional, mining engineers, &c. The directors are: E. C. Mair, 22, Brunswick Square, W.C.1, J. J. Walker, Woodlands, Lutton, Lincs, and A. L. R. Walton, Clarghyll, Shirley Avenue, Shirley, Surrey.

W. B. Simms (Engineers), Ltd.—Private company. Registered November 14th. Capital, £1,800 in £1 shares. Objects: To acquire the business of wireless and electrical engineers and specialists carried on by Walter B. Simms and Sybil Turnbull at Sandwich, Kent, and elsewhere. The directors are: W. B. Simms (managing director), 32, King Street, Sandwich, and Mrs. S. Turnbull, "Massoko," Milford-on-Sea. Secretary: Geo. A. Sanderson. Registered office: 32, King Street, Sandwich, Kent.

Radiocraft Services (Manchester), Ltd.—Private company. Registered November 4th. Capital, £500 in £1 shares. Objects: To carry on business as radio, electrical and general engineers, &c. The permanent directors are: Bernard Burke, 55, Stamford Street, Old Trafford, Manchester, and Wm. Burke, 60, Tintern Avenue, Flixton, Manchester. Registered office: 548, Chester Road, Old Trafford, Manchester.

Johnson Electricals, Ltd.—Private company. Registered November 14th. Capital: £100 in £1 shares. Objects: To carry on the business of manufacturers of and dealers in telephone apparatus, optical, photographic and scientic instruments, gramophones, talking machines, cinematograph apparatus, wireless sets, &c. The subscribers are: H. G. Goodman, 13, Lewisham Park, S.E.13, and H. J. Gilbert, 29, Ringwood Avenue, West Croydon. Solicitors: Strong & Co., 61-2, Gracechurch Street, E.C.3.

Returns of Electrical Companies

South Metropolitan Electric Light & Power Co., Ltd.—Capital, £1,100,000 in 850,000 ordinary, 150,000 cumulative 1st preference, and 100,000 cumulative 2nd preference shares of £1. Return dated April 16th (filed September 3rd), 1935. 600,000 ordinary, 150,000 1st preference, and 100,000 2nd preference shares taken up. £492,132 paid on 247,500 ordinary, 144,632 1st preference, and 100,000 2nd preference, £357,868 considered as paid on 325,000 ordinary and 5,368 1st preference. Mortgages and charges: £500,000.

British Electric Traction Co., Ltd.—Capital, £2,998,397 15s. in £712,744 5s. 6 per cent. cumulative participating preference stock, £1,326,263 10s. 8 per cent. non cumulative preference ordinary stock, £490,992 deferred ordinary stock, 287,256 participating preference and 181,142 ordinary shares of £1 each. Return dated June 28th, 1935. All preference, preferred ordinary, and deferred ordinary stock taken up. £2,046,007 15s. paid, £483,992 considered as paid. Mortgages and charges: £1,640,274 17s. 4d.

Chamberlain & Hookham, Ltd.—Capital, £100,000 in 10,500 ordinary and 9,500 preference shares of £5. Return dated June 12th, 1935. 10,100 ordinary and 8,000 preference shares taken up. £36,990 paid on 100 ordinary and 7,298 preference shares, £53,510 considered as paid on 10,000 ordinary and 702 preference shares. Mortgages and charges, nil.

New Process Welders, Ltd.—The nominal capital has been increased by the addition of £1,970, beyond the registered capital of £8,030. The additional capital is divided into 1,750 ordinary "B" shares of £1 each and 4,400 deferred shares of 1s. each. The 2,000 ordinary and 6,000 cumulative preference shares of £1 each and 600 ordinary "B" shares of 1s. each, are to be converted into 2,000 "A" ordinary, 6,000 "B" ordinary, and 600 deferred shares respectively.

Radialaddin (Disposals), Ltd.—F. F. Sharles, of 63, Coleman Street, E.C.2, ceased to act as receiver and/or manager on November 5th, 1935.

Horton, Smith & Co., Ltd.—H. Reynolds, C.A., of 54, Finsbury Court, E.C.2, was appointed receiver and manager on November 4th, under powers contained in debentures dated March 28th and August 1st, 1935.

Lincolnshire & Central Electric Supply Co., Ltd.—Particulars filed of 4 per cent. debenture stock, to secure not more than £400,000, authorised June 19th, 1935, and covered by trust deed dated October 23rd, 1935, the amount of the present issue being £400,000. Property charged: Shares in various companies and the company's undertaking and other property, present and future, including uncalled capital. Trustees: Trustees Corporation, Ltd., Winchester House, E.C.

Chislehurst Electric Supply Co., Ltd.—Capital, £50,000 in £1 shares. Return dated March 26th (filed October 18th), 1935. 15,000 shares taken up. £15,000 paid. Mortgages and charges, nil. A return of allotments, made up to May 1st, 1935, shows a further 15,000 shares allotted for cash.

County Electrical Co. (Pendleton), Ltd.—Capital, £2,000 in £1 shares. Return dated June 21st, 1935. 1,000 shares taken up. £1,000 paid. Mortgages and charges, nil.

Western Telegraph Co., Ltd.—Capital, £3,500,000 in £3,118,950 ordinary stock and 38,105 shares of £10. Return dated June 6th, 1935. £3,118,950 ordinary stock issued. £2,339,650 paid, £779,300 considered as paid. Mortgages and charges: £818,675.

Greenwood & Batley, Ltd.—Capital, £600,000 in 140,000 7 per cent. cumulative preference, 354,585 ordinary, and 105,415 unclassified shares of £1. Return dated July 19th, 1935. 110,660 preference and 354,585 ordinary shares taken up. £201,312 paid (£1 per share on 69,340 preference and 121,340 ordinary, 10s. per share on 12,520 ordinary, and 6s. per share on 14,660 preference shares), leaving £26 calls unpaid, £247,385 considered as paid on 26,660 preference and 220,725 ordinary shares. Mortgages and charges: £100,000.

Hooper's Telegraph & India Rubber Works, Ltd.—Capital, £50,000 in 1,000 preference and 4,000 ordinary shares of £10. Return dated July 1st, 1935. All shares taken up. £40,000 paid on 4,000 ordinary shares, £10,000 considered as paid on 1,000 preference shares. Mortgages and charges, nil.

Castle Fuse & Engineering Co., Ltd.—Capital, £15,000 in £1 shares. Return dated July 2nd, 1935. All shares taken up.

£12,998 paid, £2,000 considered as paid, £2 calls unpaid. Mortgages and charges: £1,537 9s. 9d.

Sykes & Dyson, Ltd.—Satisfaction in full on September 18th, 1935, of mortgage dated September 11th, 1924, and registered September 23rd, 1924. (According to the register of mortgages, the mortgage registered September 23rd, 1924, originally secured all moneys due to bank.)

Rational Electrical & Neon Co., Ltd.—Debenture dated November 5th, 1935, to secure the sum which is now or shall be owing by the company to the chargee, on account of moneys advanced to the company. Property charged, the company's undertaking and property, present and future, including uncalled capital. Holder: Dame Grace Indja Thomson, Shepherds Green, Henley-on-Thames.

Piccadilly Electrical, Ltd.—Debenture dated November 1st, 1935, to secure £500 charged on the company's property, present and future, including uncalled capital. Holders: E. E. Hamani, L. H. Altaras and W. Wolfe, trading as Altham Radio Company, 25, Mosley Street, Manchester.

Architectural Lighting, Ltd.—The nominal capital has been increased by the addition of £5,000 beyond the registered capital of £11,500. The additional capital is divided into 5,000 6 per cent redeemable preference shares of £1 each.

Magnacore, Ltd.—F. F. Sharles, 63, Coleman Street, E.C., ceased to act as receiver and manager on November 11th, 1935.

S. D. Products, Ltd.—F. H. Taylor, 188, Mitcham Road, S.W.17, ceased to act as receiver and/or manager on August 23rd, 1935. (Notice filed November 12th, 1935.)

Atlas Electric & General Trust, Ltd.—Capital, £6,500,000 on 3,000,000 preference, 3,000,000 ordinary, and 500,000 unclassified shares of £1. Return dated July 25th, 1935. All the preference and ordinary shares taken up. £1,749,078 paid on 1,214,189 preference and 534,889 ordinary shares. £4,250,922 considered as paid on 1,785,811 preference and 2,465,111 ordinary shares. Mortgages and charges, £750,000.

E. K. Cole, Ltd.—Capital, £500,000 in 800,000 ordinary shares of 5s. and 300,000 7 per cent. cumulative participating preferred ordinary shares of £1. Return dated July 29th, 1935. 745,600 ordinary and 184,480 preferred shares taken up. £270,220 paid on 342,960 ordinary and 184,480 preferred ordinary shares. £100,660 considered as paid on 402,640 ordinary shares. Mortgages and charges, nil.

Herne Bay and District Electricity Supply Co., Ltd.—Capital, £120,000 in 100,000 ordinary and 20,000 deferred shares of £1. Return dated July 25th (filed August 7th), 1935. 90,006 ordinary and 20,000 deferred shares taken up. £90,006 paid on the ordinary shares. £20,000 considered as paid on the deferred shares. Mortgages and charges, £20,000.

Electric Construction Co., Ltd.—Capital, £400,000 in £1 shares (100,000 preference and 300,000 ordinary). Return dated July 2nd, 1935. 62,780 preferred and 300,000 ordinary shares taken up. £116,490 paid on 36,490 preference and 80,000 ordinary shares. £246,290 considered as paid on remainder. Mortgages and charges, £112,960.

Falconar, Gross & Co., Ltd.—Capital, £7,000 in 3,500 preference and 3,500 ordinary shares of £1. Return dated July 18th, 1935. 3,300 preference and 2,002 ordinary shares taken up. £2 paid. £5,300 considered as paid. Mortgages and charges, £4,000.

Rawlings Bros., Ltd.—Capital, £100,000 in 30,000 preference and 70,000 ordinary shares of £1. Return dated July 26th, 1935. 21,903 preference and 61,401 ordinary shares taken up. £83,304 paid. Mortgages and charges, nil.

E. Saunders (Margate), Ltd.—Capital, £3,000 in £1 shares. Return dated July 17th, 1935. 20 shares taken up. £20 paid. Mortgages and charges, nil.

City Notes

Electric & Musical Industries, Ltd.—In the course of his speech at the annual meeting held on November 15th, Mr. A. Clark (chairman) said that steady progress was being made in the field of household appliances and there was a satisfactory growth of refrigerator sales at home and abroad. Their dealer organisation was being strengthened and a number of building concerns engaged in housing developments were installing their refrigerators. The factories at Hayes were working full time and the output of receiving sets and radiograms was again more than that of any other concern in Great Britain. In anticipation of the future demand for television receiving sets, as well as for the expansion of research and storage accommodation, new buildings had been erected at Hayes. An order for television apparatus for installation at Alexandra Palace had been received by the Marconi-E.M.I. Television Co., Ltd., from the British Broadcasting Corporation, and it was under construction at their Hayes works and the Marconi works at Chelmsford. It was expected that the new station would be completed next spring. The manufacture of television sets was not part of the business of the Marconi-E.M.I. company and would be carried on by their company, and they expected to be able to supply public demands when television broadcasting began next year. Patent rights had been obtained from many important experimental laboratories such as those of the Radio Corporation and General Electric Co. of America; of the Telefunken Co., the Siemens Co., and the A.E.G. of Germany; and of the Marconi Co. of England. To all these must be added the results of the work of their own staff. The outlook was satisfactory; during the last four months the sales of radio sets had shown a further increase, and although an outstanding improvement in foreign trade could not be expected so long as restrictions remained as they were, trading had been better in some countries during the first months of the current year. They did not expect any appreciable profit during the current year from the introduction of television due to the fact that experimental broadcasting would not begin before the spring.

The Musselburgh & District Electric Light & Traction Co. has prepared a scheme for the reorganisation of the share capital and the arrears of preference dividend. It is proposed to convert the 50,400 preference and 51,007 ordinary shares into ordinary stock. In consideration for the cancellation of arrears of preference dividend totalling £76,500, representing 152½ per cent., and of preferential rights, £43,356 ordinary stock out of £51,007 is to be surrendered for distribution among the present preference share holders. On the basis of the profit and loss for 1934 the profit balance would be sufficient after providing for normal depreciation and interest and sinking fund on the debentures to enable the payment of a dividend of 2 per cent. on the reorganised capital. No dividend has ever been paid on the ordinary shares. Meetings to consider the scheme will be held on December 9th.

The Anglo-Portuguese Telephone Co., Ltd., offers to the ordinary and "A" ordinary shareholders 123,750 ordinary shares of £1 each at 25s. per share, in the proportion of one new share for every eight shares held. The new shares will rank for dividend as from January 1st next, but will not be entitled to participate in any distribution by way of final dividend which may be declared in respect of 1935. Subject to this condition, the new shares will be identical with the existing issued ordinary shares. In their circular to the shareholders the directors state that the proceeds from the new issue will be applied to reducing the amount of loans made to meet day-to-day requirements, which now total £210,000. The whole of the present issue has been underwritten by the Telephone & General Trust, Ltd.

S. Smith & Sons (Motor Accessories), Ltd., report a net profit for the year ended August 3rd last, after providing £12,262 for income tax, of £137,383 as compared with £125,356 in the preceding year. Dividends are being maintained at 14 per cent. on the preferred ordinary shares and 25 per cent. on the deferred ordinary shares, while £30,000 is placed to general reserve and £5,000 is written off patents, leaving £66,278 to be carried forward, an increase of £1,883 over 1933-34. The report states that sales of the principal lines manufactured by the company have increased, while controlling interests in businesses connected with the manufacture of domestic clocks and instruments for aircraft have been acquired.

Companies to be Struck Off the Register.—The names of the following companies will be struck off the Register at the expiration of three months unless cause is shown to the contrary: Darimont Electric Batteries, Ltd.; Somac Electrical Heating Co., Ltd.; Wireless Apparatus, Ltd.; United Electric Stores (Walworth), Ltd.

The Melbourne Electric Supply Co. is paying a final dividend of 2 per cent., tax free, on the consolidated ordinary stock, making 4 per cent., tax free, for the year. This dividend is paid on an additional £400,300 bonus stock issued in December last. The total dividend for 1933-34 was 6½ per cent.

The Ascot District Gas & Electricity Co.—Messrs. A. & W. Richards have been instructed to offer for sale by tender £24,000 of 4 per cent. perpetual debenture stock of this company.

Johnson & Phillips, Ltd.—The recent issue to shareholders of 100,000 ordinary shares of £1 each at £1 per share has been heavily oversubscribed. Allotment letters have been posted.

The Canadian General Electric Co. is paying a quarterly dividend on its common stock of 75 cents a share (same).

The Electric Furnace Co., Ltd., has declared interim dividends of 3½ per cent., less tax, on the cumulative preferred ordinary shares, and 2½ per cent., less tax, on the ordinary shares.

W. T. Glover & Co., Ltd.—The *Financial Times* states that the company's capital has been increased to £500,000 by the creation of 285,150 ordinary shares of £1 each.

Stocks and Shares

TUESDAY EVENING.

THE result of the General Election had at first a stimulating effect upon Stock Exchange prices. The large groups of members and their staffs who gathered in the House to watch the results as these came through, a week ago, were obviously pleased with the figures, the influence of which promptly became apparent upon prices. Not only in the purely gilt-edged market, but in other parts of the Stock Exchange as well, a general recovery set in. People tumbled over one another, in the popular phrase, to pick up stocks and shares before the grand rise came. This rise was expected to take place in the early days of this week. Like a good many other anticipations in connection with stocks and shares, the full extent of the expectation did not materialise. Nevertheless, prices show a number of decided improvements and in the shares with which our lists are more particularly concerned, it will be observed that nearly all the changes are in the upward direction.

Politics and Prices

What led to a reaction from the top prices was a re-entry of fears lest foreign politics should bring about a situation in which the Continent would be again tempted to turn a seller of British securities, and take advantage of the rises that had occurred in the first flush of the General Election excitement. Sanctions against Italy came into force on the Monday in this week and, with home politics occupying less public attention, people began to ask the extent to which the move might lead. This brought about a falling away of prices in British Government and similar securities. So far, however, as the stocks in the electricity boards are concerned, the previous rises have been fully held. London Passenger Transport stocks have been in demand, with the result that

the " A " and " B " fixed-interest issues, and the " C " stock all show improvements, the last-named being 2 points higher at 106. Investment money is going into Transport " C " stock because of the impression that the last-paid 4 per cent. dividend will be increased, and that, in respect of the current twelve months, possibly 5 per cent. will be distributed. Central Electricity 3¼ per cent. at 102 has gained a point. Other stocks in this market are noticeably firm.

Electricity Supply Shares

Half-a-score of rises are shown in the list of shares in the home electricity supply companies. County of London are better at 55s., Metropolitans at 53s. and South Londons at 34s. In the provincial group, there are rises in Midland Counties, Northamptons, Lancashires, and Yorkshire Electrics. Business in the electricity supply market has been comparatively quiet, popular attention being turned more to shares in the manufacturing and equipment group, where so large a turnover of shares has occurred, that it may be described, without exaggeration, as enormous.

Midland Electric Corporation

Of the gilt-edged electricity supply stocks, £30,000 Midland Electric Corporation for Power Distribution 3½ per cent. mortgage debenture is on offer at 101½, free of stamp duty. Mention has been previously made of this particular issue, the interest on which was covered by last year's profits some fourteen times over. The first interest payment of 19s. per cent. falls due next month. The stock at the present price yields £3 4s. per cent. on the money. It is redeemable at 100 in 1973, but the company has the right to pay it off at any time after 1965.

Manufacturing and Equipment

Associated Electrical Industries ordinary are particularly active, in the market for manufacturing and equipment. Mention was made here last week of the line of 170,000 shares that American holders have recently sold to people in this country at about 35s. per share. The price rose to 41s. 6d. in the Election excitement of Monday, but subsided later on to 40s., which leaves the price 1s. up on the week. An increase in the dividend to 8 per cent. is generally looked for, and this is held to justify the current quotation, investment nowadays looking more at earnings, present and prospective, than at the actual yield which industrials offer at current prices. In General Electric ordinary, the daily volume of business is also on a very large scale. The price rose to 70s., easing off to 69s., which leaves a gain of 2s. 6d. on the week. In this case also optimism is busy with estimates of a possible increase in the next dividend. British Insulated, Callenders, Enfields and Henleys are all higher. Ericssons have gone back ⅛ to 32s. 6d. Johnson & Phillips are a good market at 49s. 6d., this being ex dividend and ex rights. The new shares have risen to 9s. 3d. premium, the price having more than doubled since the shares were first offered, earlier in the month, to the holders of the old shares. In Ever-Ready there has been a considerable volume of business and the price has risen 9d. to 24s.

Electric and Musical Industries

Official confirmation has been forthcoming this week of the report, quoted here last week, that the Radio Corporation of America had sold to British interests its holding of shares in Electric and Musical Industries, Ltd. The deal involved a sum of over two million pounds sterling. The transfer of the money was duly sanctioned by the British Treasury. " Emmi " shares remain an animated market in the near neighbourhood of 27s. At the meeting of shareholders held a few days ago, the chairman gave detailed information of the progress which television is making in this country. He referred also to the expansion of the company's business throughout the Empire.

Cable and Wireless

Cable " A " stock has jumped into favour with a rise of 2½ to 29½, on talk of a favourable index number being published next week. All the cable companies are assumed to be doing well by reason of the various important happenings with which the world is concerned at this present time. Cable & Wireless preference has gained 2 points at 105 and even the " B " stock is 1¼ up at 9¼. Relatively greater than any of these is the advance of 37s. 6d. in Globe Telegraph and Trust ordinary shares, now up to 15¾. The preference shares are 10s. harder at 14. Anglo-American Telegraph stocks have improved. No net change has occurred in American Telephone & Telegraph at 152½ or in Internationals at 12.

Miscellaneous Matters

The Brush Company is amongst those that are benefiting from orders in connection with the trolley-bus, and this explains the rise of nearly ten points in Brush ordinary stock during the past fortnight. The deferred stock of the British Electric Traction Co. is 55 points higher this week at 1215; the 8 per cent. preferred ordinary recovered, and at once, the half-yearly dividend deducted last Monday from the price. Crompton Parkinsons are revolving around 95s. Market gossip says that a share-for-share bonus issue may be forthcoming, in addition to a repetition of the 7 per cent. bonus, in shares, given last year. The cash dividend is expected to be continued at 12½ per cent., with perhaps some slight addition. Maybe the guesses will be resolved, by official statement, over the coming week-end.

Share List of Electrical Companies

	Nom.	Dividend 1933.	Dividend 1934.	Price Nov. 19.	Rise or Fall.	Yield p.c. £ s. d.
HOME ELECTRICITY COMPANIES.						
Bournemouth and Poole	1	15	15	3⅝	—	3 17 5
City of London	1	7½	7½	37/-	—	4 1 0
Clyde Valley	1	7	8	43/6	—	3 13 7
County of London	1	10½	10½	55/-	+6d.	3 16 4
Edmundson's 7% Pref.	1	7	7	36/-	—	3 17 9
Do. Ord.	1	7	8	43/-	+1/-	3 14 5
Elec. Dis. Yorkshire	1	9	9	46/-	—	3 17 9
Elec. Fin. and Securities	1	12½	12½	3 7/16	—	3 12 9
Elec. Supply Corporation	1	11	11	3½	—	3 10 3
Lancs Light and Power	1	7½	7½	38/6	+6d.	3 18 0
Lond. Assoc. Electric	1	—	—	34/6	+6d.	4 1 2
London Electric	1	7	8	39/-	+6d.	4 2 0
London Power deb. Red.	Stock	5	5	108½	—	4 12 4
Metropolitan	1	10	10	53/-	+1/-	3 15 6
Midland Counties	1	7	7	38/-	+6d.	3 13 9
Mid. Elec. Power	1	8	8	41/3	—	3 17 6
North Eastern Electric Ordinary	1	6	6	34/-	—	3 10 7
Do. 7% Pref.	1	7	7	35/-	+6d.	4 0 0
Northampton	1	10	10	52/6	+ 1/16	3 16 3
Notting Hill 6% Pref.	10	6	6	14½	—	4 2 9
North Met. Elec. Ordinary	1	10	10	57/6	—	3 9 5
Do. do. 6% Pref.	1	6	6	32/-	+6d.	3 15 0
Scottish Power	1	8	8	42/6	—	3 15 3
South London	1	7	7	34/-	+6d.	4 2 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	25/6	+6d.	5 17 8
Yorkshire Elec.	1	8	8	44/6	+1/-	3 12 0
PUBLIC BOARDS.						
Central Electricity, 1950–70	Stock	5	5	115	—	4 7 0
Do. 1955–75	„	5	5	117	—	4 5 6
Do. 1951–73	„	4½	4½	112	—	4 0 4
Do. 1963–93	„	—	3½	102	+1	3 8 8
London Elec. Trans. Gtd.	„	—	2½	97	—	2 11 8
London & Home Counties, 1955–75	„	4½	4½	114	—	3 19 0
London Passenger Transport, A.	„	—	4½	122½	+2	3 13 8
Do. do. B.	„	—	5	128½	+1	3 17 10
Do. do. C.	„	3½	4	106	+2	3 15 6
West Midlands Joint Elec. 1948–68	„	—	5	115	—	4 7 0
TELEGRAPH AND TELEPHONE.						
American Tel. & Tel.	$100	9	9	152½	—	5 18 0
Anglo-Am. Tel. Pref.	Stock	6	6	119	+½	5 0 10
Do. Def.	„	1½	1½	28½	+½	5 5 2
Cable & Wireless 5½% Pref.	„	2¾	4½	105	+2	3 18 7
Do. A. 7½% Ord.	„	Nil	Nil	29½	+2½	—
Do. B. Ord.	„	Nil	Nil	9¼	+1¼	—
Globe Tel. & Tel. Ord.	10	2½	3½*	15¾	+1¼	2 4 4
Do. do. Pref.	10	6	6	14	+½	4 5 9
Great Northern Tel.	10	20	20	39	—	5 2 7
Marconi-Marine	1	10	7½	37/6	—	4 0 0
Oriental Telephone Ord.	1	12	12	3 1/16	—	*3 18 4
HOME AND FOREIGN TRAMS, ETC.						
Anglo-Arg. Trams First Pref.	5	Nil	Nil	9d.	—	—
Do. do. 2nd Pref.	5	Nil	Nil	9d.	—	—
Do. do. 5% Deb.	Stock	Nil	Nil	5	—	—
British Electric Traction Df. Ord.	„	5	5	1215	+55	—
Do. do. Pref. Ord.	„	8	8	108xd.	+3	4 15 3
Brazil Traction	100	—	—	9½	+1	—
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	99½	—	5 0 6
Mexican Light Common	100	Nil	Nil	2½	—	—
Do. 7% Pref.	100	7	7	4½	—	—
Do. 1st Bonds	$500	5	5	40	—	—
Victoria Falls Ord.	1	20	20	3½	+ 1/16	—
West Riding	1	5	6½	46/3	− 1/16	2 16 9
MANUFACTURING COMPANIES.						
Aron Electricity Ord.	1	10	15	60/-	—	5 0 0
Assoc. Elec. Ord.	1	4	6	40/-	+1/-	3 0 0
Do. Pref.	1	8	8	37/-	—	4 6 0
Babcock & Wilcox	1	6	8	52/6	+ 1/16	3 1 0
British Aluminium Ord.	1	5	7½	43/6	+1/-	3 9 0
British Insulated Ord.	1	5	15	4¼	+ 1/16	3 5 0
Brush Ord.	Stock	Nil	Nil	51	+1½	—
Callender's	1	15	15	3 11/16	+ 1/16	3 18 9
Do. 6½% Pref.	1	6½	6½	32/6	—	4 0 0
Crompton Parkinson Ord.	5/-	—	12½	4¾	+¼	0 13 0
Do. 8% Pref.	1	8	8	36/3	—	4 8 4
Edison Swan 1st Pref.	1	7½	7½	27/6	—	5 9 0
Electric Construction	1	Nil	3½	30/9	—	2 5 10
Enfield Cable Ord.	1	25	25	5½	+ 1/16	4 17 5
English Electric	1	Nil	Nil	18/6	+6d.	—
Do. do. Pref.	1	Nil	Nil	22/6	—	—
Ericssons Tel.	5/-	—	24	32/6	− 1/16	—
Ever Ready	5/-	35	35	24/-	+9d.	7 5 10
Ferranti Pref.	1	7	7	27/6	—	5 1 10
G.E.C. Pref.	1	6½	6½	32/6	—	4 0 0
Do. Ord.	1	8	10	69/-	+2/6	2 18 0
Henley's	1	30	30	7	+ 1/16	4 5 9
Do. 4½% Pref.	5	4½	4½	5½	—	3 16 8
India-Rubber Preferred	1	—	5½	1½	—	4 17 9
Johnson & Phillips	1	5	7½	49/6	+2/6	3 0 10
Siemens Ord.	1	6½	4	25/-	—	3 4 1
Telegraph Construction	£1	Nil	Nil	25/-	+ 1/16	—

* Dividends are paid free of Income Tax.

Published Specifications

Compiled expressly for this journal by a firm of chartered patent agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings will be taken.

1933

35645. "Thermionic-valve modulation systems." Hazeltine Corporation. January 30th, 1933. (436940.)

1934

2401. "Television or like systems." J. C. Wilson and Baird Television, Ltd. January 23rd, 1934. (437021.)

5509. "Electrical transmission of sound, pictures, or the like." J. J. Lamb and F. Kirschstein. February 18th, 1933. (437263.)

7958. "Intermittent or instantaneous type of electric water-heaters." R. Annand. March 13th, 1934. (437103.)

9664. "Voltage regulators for road and rail vehicle electric-lighting systems." Highfield Electrical Co., Ltd., and F. W. W. Highfield. March 28th, 1934. (437269.)

11191. "Electrically driven vacuum-cleaners." Electrolux, Ltd. April 15th, 1933. (436946.)

11236. "Radio receiving apparatus." Telefunken Ges. für Drahtlose Telegraphie and P. Hermanspann. April 13th, 1934. (436948.)

11434. "Electric convertor systems." British Thomson-Houston Co., Ltd. April 14th, 1933. (436952.)

11521. "Electric switch-boxes." N. Allday and R. Bain. April 17th, 1934. (436954.)

11595. "Electricity induction meters." G. Wall and Associated Electrical Industries, Ltd. April 17th, 1934. (436957.)

11800. "Electric gramophones." W. M. Braun. April 19th, 1934. (437193.)

11839. "Electrical switching devices for measuring or control apparatus." W. H. Joens & Co., Ges. May 12th, 1933. (Cognate application 11840/34.) (437110.)

11921. "Electric motors, particularly for gramophones and like sound-reproducing machines." F. J. Offen and Garrard Engineering & Manufacturing Co., Ltd. April 20th, 1934. (437112.)

12164. "Method of and means for the transmission of electric signals." F. Rimmington and A. W. Grantham. April 23rd, 1934. (437028.)

12210. "Oscillatory circuit arrangements and reactance devices for use therein." Telefunken Ges. für Drahtlose Telegraphie. April 21st, 1933. (Cognate application 12211/34.) (437201.)

12359. "Mechanically operated time switches, particularly for switching electric circuits in and out." A. B. Karlsson. April 24th, 1934. (436968.)

12640. "Control systems for alternating current circuits." British Thomson-Houston Co., Ltd. April 26th, 1933. (437118.)

12747. "Electric communication cables." Standard Telephones & Cables, Ltd., and R. L. Hughes. April 27th, 1934. (437293.)

12748. "Piezo-electric devices." Standard Telephones & Cables, Ltd. (Western Electric Co., Inc.). April 27th, 1934. (437294.)

12813. "Terminal connections for electric heating elements." W. B. Cleverly and British Resistor Co., Ltd. April 27th, 1934. (437299.)

12880. "Electric control systems." British Thomson-Houston Co., Ltd. April 29th, 1933. (Addition to 433162.) (436971.)

12893. "Very-short-wave radio transmitting apparatus." Marconi's Wireless Telegraph Co., Ltd., and A. A. Linsell. April 28th, 1934. (437040.)

12901. "Radio receivers and like modulated carrier-wave apparatus." Marconi's Wireless Telegraph Co., Ltd., and G. M. Wright. April 28th, 1934. (437305.)

12902. "Radio and like modulated carrier-wave receivers." Marconi's Wireless Telegraph Co., Ltd., and G. M. Wright. April 28th, 1934. (437306.)

12903. "Radio and like modulated carrier-wave receivers." Marconi's Wireless Telegraph Co., Ltd., and G. M. Wright. April 28th, 1934. (437307.)

12965. "Electric cables." Macintosh Cable Co., Ltd., and A. Sargent. April 30th, 1934. (437041.)

13453. "Electromagnetic cores." J. Swinburne. May 4th, 1934. (437126.)

13459. "Arc welders." C. H. Benn and C. L. Benn. May 4th, 1934. (437213.)

13980. "Combined electric switches and plug couplings." Walsall Conduits, Ltd., and E. Perkins. May 9th, 1934. (437309.)

14434. "Electrical conductors." London Electric Wire Co. and Smiths, Ltd., and J. R. Abraham. May 12th, 1934 (437310)

14664. "Electric lighting fittings." General Electric Co., Ltd., and R. O. Ackerley. May 15th, 1934. (437047.)

15415. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. May 26th, 1933. (437131.)

16646. "Electric high-tension fuses." A. D. Ferguson and Associated Electrical Industries, Ltd. June 4th, 1934. (437214.)

17609. "Switches for controlling electric lifts." W. Wadsworth & Sons, Ltd., and H. J. Disley. June 14th, 1934. (436977.)

19729. "Electric lighting fittings." General Electric Co., Ltd., and A. J. Burbidge. July 4th, 1934. (436983.)

21530. "Thermionic-valve circuits." A. L. M. Sowerby and A. C. Cossor, Ltd. July 23rd, 1934. (437316.)

22470. "Carriers for recording sound or other oscillations." Philips-Miller Naamlooze Vennootschap. August 24th, 1933. (437138.)

23384. "Cathode-ray tubes." Fernseh Akt.-Ges. August 12th, 1933. (437216.)

23555. "Electric protective arrangements." British Thomson-Houston Co., Ltd., and P. Mathews. August 15th, 1934. (437217.)

24435. "Electric converting systems." British Thomson-Houston Co., Ltd. August 25th, 1933. (437218.)

27523. "Inductive regulators." British Thomson-Houston Co., Ltd. September 25th, 1933. (437220.)

29029. "Electrically heated radiators." R. Glanzman, jun., and H. Bochsler. October 10th, 1934. (437322.)

29260. "Electric motors." A. H. Stevens (Leland Electric Co.). October 12th, 1934. (437221.)

29726. "Electric-discharge devices comprising luminescent materials." General Electric Co., Ltd. (Patent-Treuhand-Ges. für Elektrische Gluhlampen). October 17th, 1934. (437323.)

31236. "Apparatus for detecting faults in transformers." British Thomson-Houston Co., Ltd. November 1st, 1933. (437223.)

31653. "Electrodeposition of metals." C. Arnold (Harshaw Chemical Co.). November 3rd, 1934. (437224.)

32984. "Variable electric condensers." Stratton & Co., Ltd., and G. S. Laughton. November 16th, 1934. (437150.)

34244. "Safety-switch devices for electrically heated apparatus." L. Satchwell. November 28th, 1934. (437071.)

34260. "Apparatus for the production of periodic electric-current impulses." E. Ostwald. November 28th, 1933. (437229.)

1935

715. "Electric lamps." A. G. Crossland. January 9th, 1935. (437077.)

2800. "Spark-plugs." F. M. Anthony, K. C. Gillis, and D. B. Edwards. January 28th, 1935. (437081.)

3572. "Electrically operated temperature-regulating mechanism." Vapor Car Heating Co., Inc. February 26th, 1934. (437002.)

6007. "Electromagnetic band brake or clutch." A. Ryba, J. Reinisch, and E. Vinatzer. September 22nd, 1934. (437162.)

7180. "Electric resistances." British Thomson-Houston Co., Ltd. March 7th, 1934. (437331.)

7328. "Electric transformers." General Transformer Co., Ltd., J. B. Hawkins, and B. S. Lyons. March 8th, 1935. (437332.)

8157. "Electric-discharge devices." Standard Telephones & Cables, Ltd. October 3rd, 1934. (437167.)

9811. "Electric smelting furnaces." Akt.-Ges. Brown, Boveri & Cie. May 3rd, 1934. (437333.)

10724. "Method of and installation for making X-ray exposures." Naamlooze Vennootschap Philips' Gloeilampenfabrieken. April 6th, 1934. (437093.)

14408. "Electron-discharge devices." Standard Telephones & Cables, Ltd. August 25th, 1934. (437251.)

14796. "Electric cables." Soc. Italiana Pirelli. June 2nd, 1934. (437098.)

15550. "Radio aerials." Compagnie Générale de Télégraphie Sans Fil. June 9th, 1934. (437099.)

15908. "Electrodes for electric discharge vessels." W. Lehmann. June 1st, 1934. (437337.)

16811. "Electric resistance heaters." British Thomson-Houston Co., Ltd. June 12th, 1934. (437254.)

18142. "Television or like systems." J. L. Baird and Baird Television, Ltd. May 15th, 1935. (Divided out of 431339.) (437339.)

18345. "Television, telekinematographic, or like systems." P. V. Reveley, J. L. Baird and Baird Television, Ltd. June 26th, 1935. (Addition to 431458.) (437340.)

23424. "Thermionic-valve modulation system." Hazeltine Corporation. January 30th, 1933. (Divided out of 436940.) (437016.)

26168. "Electricity induction meters." G. Wall and Associated Electrical Industries, Ltd. April 17th, 1934. (Divided out of 436957.) (437018.)

Trade Mark Applications

The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from November 13th :—

No-Ray (two different designs and lettering). Nos. 560589 and 560591. Class 11. Electric lamps for curative purposes or in relation to the health of men or animals. Nos. 562136 and 562263. Class 13. Electric lamps (ordinary).—Radium-Ray Co., Roden Street Works, Ilford, Essex.

Doto Crystal Lamp (lettering and design). No. 559996. Class 13. Twin-filament electric lamps (ordinary) for household use. —Dotolite Co., Ltd., also trading as the Crystal Twinlight Co., 44-46, Kingsway, W.C.2.

Solium. No. 563531. Class 13. Heat and light reflectors made of ordinary metal.—Ferranti, Ltd., Hollinwood, Lancs.

Diakon. No. 563739. Class 50. Synthetic resins sold in the form of sheets, rods, tubes and shaped pieces, and as moulding powders.—I.C.I. (Fertilisers and Synthetic Products), Ltd., Imperial Chemical House, Millbank, Westminster, S.W.1.

Fuel Luncheon Club

A Fuel Luncheon Club is to be formed at which short addresses are to be given on technical and economic matters concerned with fuel and fuel appliances. The membership is to be restricted to technical men who are members of those societies largely engaged in the study of fuel problems, each such society being represented on the Council of the club, but not responsible financially or otherwise for the control or operation of the club, which is to be an entirely independent body. The Coke Oven Managers' Association, Electrical Power Engineers' Association, Institute of Fuel, Institution of Gas Engineers, Institution of Mining Engineers, Institution of Petroleum Technologists and the Low Temperature Coal Distillers' Association have each appointed two of their members and their secretary to represent them on the Council. At an inaugural luncheon to be held at the Connaught Rooms on November 27th Sir John Cadman, first president, will briefly explain the aims and rules of the club, give an address, and invite membership.

New Work for Contractors

Particulars of new works and building schemes for the use of electrical installation contractors and traders

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Adwick-le-Street (YORKSHIRE).—Public offices and council chamber; U.D.C. surveyor.

Alnwick (NORTHUMBERLAND).—Houses (60); M. T. Wilson, U.D.C. surveyor.

Ashford (KENT).—Houses (62), Rugby Gardens site; U.D.C. surveyor.

Barking.—Houses (52), £25,450; borough surveyor.

Barnsley.—Offices for the Barnsley Permanent Building Society, Regent Street (£50,000), with electrical work.

Bedfordshire.—Senior and junior school, Harrold; county surveyor.

Berkshire.—Extensions, &c., to County Girls' School, Wokingham; junior and senior schools, Farington; and reconstruction of County Boys' School, Windsor, for County E.C.

Bewdley.—Houses (30), Bark Hill site; borough surveyor.

Bilston.—Alterations and additions to Stonefield infants' school; Joynson Bros., architects, Butcroft, Darlaston.

Birmingham.—Additions to factory, James Boot, Argyle Street, Nechells; T. Rowbotham, builders, Coventry Road, Birmingham.

Birtley (Co. DURHAM).—Masonic Hall; W. Norman, builder, 3, West Lane, Chester-le-Street.

Blyth.—Infants' school to replace Plessey Road Infants' School, for E.C.; borough engineer.

Boston.—School, Brothertoft Road; director of education.

Bournemouth.—Houses (84), Kinson estate; John H. Wilson & Sons, builders. Cinema, Christchurch Road, for the Odeon Theatres, Ltd. Hospital, Canford Magna; borough engineer.

Bradford.—Houses (50), Moor Lane and Birkenshaw Bottoms; Frank Powell, builder, Burkhill, Birkenshaw.

Bridgnorth.—Houses (20), Highley; R.D.C. surveyor.

Brighouse.—Houses (38), Half Moon Lane, adjoining Halifax Road; E. & F. Lapish, builders, Castle Fields estate.

Bromley (KENT).—Alterations and extensions to the electricity showrooms and offices, West Street; electrical engineer.

Cardiff.—Houses (730), Hancocks Field; city engineer.

Chertsey.—Houses (378), Wey Manor estate, for R. F. Bartlett. Houses (20), Fordwater Road, for Hygienic Homes, Ltd.

Consett.—Houses (60); T. Hutton, U.D.C. surveyor.

Coventry.—Junior school (500 places) and technical college gymnasium; director of education.

Darlington.—Cinema behind the Theatre Royal for T. H. Pailor, cinema lessee, West Hartlepool.

Deal.—School, Upper Deal, for E.C.

Derby.—Additions to Bretby Hall Orthopædic Hospital (£26,481), with electrical work; Gee, Walker & Slater, builders, Derby.

Devonshire.—Junior schools, Crediton and Cullompton, and alterations to Highweek Senior School, Newton Abbot; county architect.

Dudley.—Extensions to W. Goodyear, Ltd., Hope Street.

Dundee.—Reconstruction of Dundee High School (£30,000); D. B. McLay, City Chambers.

Durham.—Houses (136), Bowburn; W. Forster, builder, Houghton-le-Spring.

Ealing.—Factory, Aintree Road, for Crowkuir, Ltd.; Percy Bilton, Ltd., 113, Park Street, London, W.1.

Earley (BERKSHIRE).—Enlargement to Church of England schools; managers.

East Lothian.—School, North Berwick (£25,000), for County E.C.

Ebbw Vale.—Junior and infants' school; W. A. Jones, secretary, Education Authority, Council Offices.

Enfield.—Houses (141), rear Green Street; McManus & Co. Houses (624), South Lodge estate; John Laing & Son, Ltd.

Fen Drayton (CAMBRIDGESHIRE).—Houses (24), for the Land Settlement Association, Ltd.; F. C. Levitt, architect, Commerce House, Biggleswade.

Flaxton.—Development of Highthorn estate, Huntingdon Road; R. J. Pulleyn & Sons.

Gillingham (KENT).—Houses (39), Chalkenden Avenue, for Vinall & Chappell.

Glasgow.—Houses (136) for aged, Crookston; housing director. Factory, Port Dundas (£50,000); MacKeen, Ltd., 280, St. George's Road, Glasgow. Extension to factory, Farnell Street; J. Allan & Son, Ltd. Extensions to works, Lochburn Road; Paterson Hughes Engineering Co., Ltd. Extensions to works, South Street, Scotstoun; Albion Motors, Ltd.

Goole.—Houses (57), Marshfield and Morley Street estates; borough engineer.

Gravesend.—Reconstruction of Plaza Cinema, Windmill Street, for Mr. Shinebaum; G. B. Fraser & Co.

Hanley.—Cinema on site of Grand Theatre for Theatre Developments Corporation, Ltd. (£60,000).

Hebburn-on-Tyne.—Houses, Victoria Road West; T. A. Page, Son and Bradbury, architects, 67, King Street, South Shields.

Hertfordshire.—Public offices, Hertford (£153,997), for C.C.; James & Bywaters & Rowland Pierce, architects, 5, Bloomsbury Street, London, W.C.1.

Ilkeston.—Isolation hospital (£20,700); borough engineer.

Lancashire.—Alterations and additions to Radcliffe Technical School and Barrowfield Central School; county architect.

Lichfield.—Houses (50), Stychbrook estate; R.D.C. surveyor.

Liverpool.—R.C. school (700 places), Roby, for parish of St. Aloysius, for E.C.

London.—(WESTMINSTER).—Shops and offices, Berwick Street, for Aldrich, Blake & Richards Trust; B. L. Sutcliffe, 5, Manchester Square, W.1. Extensions to Odhams printing works, Endell Street and Wilson Street; Yates, Cook & Darbyshire, architects, 43, Great Marlborough Street, W.1.

Lowestoft.—Extensions to works, Salisbury Road; W. H. Podd, Ltd.

Macclesfield.—Houses (800), Tutherington Hall estate, near Macclesfield; C. Ogle, builder, Wood bank estate, Hall Street, Stockport.

Maidenhead.—Houses (80), Belmont Park estate, for Cripps & Green.

Malton.—Houses (20); W. Martin Jackson, Council's architect, Snydale Road, Normanton.

Manchester.—Houses and shops, Newbridge Farm estate, Blackley; James Saxon, builder, Slack Road, Cheetham Hill. Exhibition hall, stadium, car park and petrol station and residential hotel, Queen's Road, Cheetham; A. Winstanley, architect, 15, Great Ducie Street. Modern laundry, Blackley New Road, Blackley, for Prospect Laundry, Ltd., Chatham Street, and shops and houses, Bank House estate, Victoria Avenue, Blackley; Roberts & Wood, architects, 26, King Street.

Middleton (LANCASHIRE).—Electricity showrooms and offices, Mill Street; J. Pollard, borough architect.

Neath.—Houses (78) and flats, Pencaerau site; A. Alex Clarke, borough engineer, Gwyn Hall, Neath.

Newcastle (STAFFORDSHIRE).—Houses (60), Whitehouse Farm estate; F. Gibson, builder, 56A, Ashford Street, Shelton.

Newport (I.O.W.).—Cinema, High Street; Medina (Newport), Ltd.

North Riding.—Library, Eston, for the C.C.; county architect, County Hall, Northallerton.

Nottingham.—Cinema, Burton Road, Carlton (£30,000), with electrical work; R. W. Cooper, architect, Nottingham. Wholesale market, Sneinton; R. M. Finch, city engineer and surveyor.

Nottinghamshire.—Villa block at Radcliffe mental hospital; county architect, Nottingham.

Oldham.—Rebuilding Palace Theatre, for Odeon Theatres, Ltd.; H. W. Weedon, architect, Birmingham.

Ormskirk.—Houses (32), Melling; C. Brighouse, architect, Burscough Street, Ormskirk.

Port Erin (ISLE OF MAN).—Cinema electrical work; H. J. Shepherd, architect, Sheffield. Cinema, electrical work; Lomas & Barrett, architects.

Preston.—Houses (100), Royalty Lane, New Longton; J. Sutcliffe, builder, 22, Windsor Avenue, New Longton, Preston.

Rothesay.—Pavilion (£30,000), with cinematograph; burgh surveyor.

Runcorn.—Houses (150); U.D.C. surveyor.

Scarborough.—Houses (82), Cross Street; Stephenson and Whitaker, builders, Knaresborough.

Sheffield.—Houses (280), on land adjoining Chapel Town Park, Chapeltown, for A. Wroe & Sons, 84, Bawtry Road, Tinsley; W. G. Gibbs, architect, 22, Paradise Square, Sheffield. Factory, garage, shop and house, Middlewood Road, for Willis & Vera, Manner Street; Rhodes & Mitchell, builders, 472, Bellhouse Road, Shire Green. Houses (45), near Elm Lane; S. G. Bailey, builder, 210, Rock Street. Houses (31), Toftcroft Road and Bolehill Lane, Crookes; Holmes, Son & Archer, surveyors, Parade Chambers, East Parade, Sheffield.

Sheringham.—Houses (22), Pine Grove, for W. C. May.

Sittingbourne.—Business stores, High Street, for Montague Burton, Ltd., Leeds.

Southend-on-Sea.—Houses (40), Eastwood Road site; borough engineer. Secondary and senior schools, Belfairs, E.C.; director of education.

Stafford.—Houses (30), Eastlands estate; W. Whittingham, builder, Park House estate.

Staffordshire.—Hospital, Newcastle-under-Lyme (£278,000), for the P.A.C.; county architect, Stafford.

Stanley (Co. DURHAM).—Houses (250); U.D.C. surveyor.

Stratford-on-Avon.—Houses (26); borough surveyor.

Surrey.—Central schools, Surbiton, for County E.C.; secretary, Kingston-on-Thames

Swaffham.—Houses (20); U.D.C. surveyor.

Swansea.—Block of offices, with electrical and heating work, for the Great Western Railway Co., Ltd.; chief engineer, Paddington, London, W.2.

Taunton.—Houses (62), Halcon estate; Ivor F. Shellard, borough engineer.

Todmorden.—Public baths (£25,000); borough surveyor.

Tredegar.—Water supply scheme, with electric pumping plant; W. Edgar Jones, U.D.C. surveyor.

Troon (AYRSHIRE).—Cinema, Portland Street (£20,000); J. McKissack, architect, Glasgow.

Truro.—Houses (72), Tregolls; borough surveyor.

Uppingham.—Cinema, electrical work, for B. J. Willson.

Wakefield.—Houses, and small type houses, Gill Syke estate; borough architect.

Walsgrave-on-Sowe.—Houses (48), Middlescotes estate; E. K. Youell & Sons, Ltd., builders, Weigh House, Walgrave Road.

Warminster.—Houses (50), Victoria Road, for R. J. Haddock, Ltd., Tilehurst, Reading.

Warrington.—Factory, Arpley; Thames Mill Board Co.

West Hartlepool.—Houses, Golden Flats estate; J. H. Garry, architect, 47, Church Street. Houses (89), Seaton estate, for the West Hartlepool Steam Navigation Co., Ltd.; J. J. Dobson, architect, 1, Scarborough Street. Bus station for the United Automobile Services, Ltd., Grange Road, Darlington.

West Sussex.—Four schools, Bognor Regis (£50,000), and schools, Shoreham and South Lancing; E. T. Davis, director of education, Chichester.

Whitby.—Houses, Robin Hood's Bay; H. Warren Lee, promoter, 60, Gloucester Place, London, W.1.

Wigtownshire.—Schools, Sandhead, Mahaar, and Glenluce, and reconstruction of schools, Kirkcowan, Wigtown and Penninghame, for C.C.; R. G. Logan, Co. Buildings, Stranraer.

Winchester.—Hotel, shops and flats, Jewry Street, for Pettit trustees; Harding & Harding, Midland Bank Chambers.

Woodford.—Houses (78), Kensington Drive; Hill Farm Estate Co.

Worcestershire.—Extensions to Kidderminster High School for Girls, for County E.C.; A. V. Rowe, county architect, 38, Foregate Street, Worcester.